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# **food technology abstracts**

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# FOOD TECHNOLOGY ABSTRACTS

**Vol.25 No. 4**

**April 1990**

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# ABBREVIATIONS

A	ampere	ft	foot, feet	PVDC	polyvinylidene chloride
AAS	atomic absorp- tion spectro- metry	g	gram	qt	quart
abstr.	abstract	GC	gas chromatography	R	rontgen
ad lib.	ad libitum	gn	gravity	rad	rad or radian
ADP	adenosine diphosphate	gal	gallon	ref.	reference(s)
Anon.	Anonymous	gf	gram-force	rev/min	revolutions per minute
AOAC	Association of Official Analy- tical Chemists	GLC	gas-liquid chromatography	RH	relative humidity
approx.	approximately	h	hour	RNA	ribonucleic acid(s)
atm	atmosphere	ha	hectare	S.	South, Southern, etc.
ATP	adenosine triphosphate	HDPE	high density polyethylene	s.d.	standard deviation
a <sub>w</sub>	water activity	hl	hectolitre [100 l]	SDS	sodium dedecyl- sulphate
BHA	butylated	hp	horse power	s.e.	standard error
BHT	butylated hydroxytoluene	HPLC	high performance/ pressure liquid chromatography	s	second [time]
BOD	biological oxygen demand	HTST	high temperature short time	SNF	solids-not-fat
b.p.	boiling point	Hz	hertz [frequency cycles/s]	sp., spp.	species
Btu	British thermal unit	in	inch	sp.gr.	specific gravity
c-	centi- [as in cm, cm <sup>2</sup> , cm <sup>3</sup> ]	IR	infrared	summ.	summary
cal	calorie	IU	international unit	Suppl.	Supplement
cd	candela	J	joule	t	metric tonne
Ci	curie	k-	kilo- [as in kcal, kg]	temp.	temperature
CMC	carboxymethyl cellulose	K	Kelvin	TLC	thin layer chromatography
COD	chemical oxygen demand	l	litre	TS	total solids
coeff.	coefficient	lb	pound	UHT	ultra-high temperature
conc.	concentrated	lb <sub>f</sub>	pound-force	UV	ultraviolet
concn.	concentration	LDPE	low density polyethylene	V	volt
cv.	cultivar	m-	milli- [as in mg, ml, mm]	var.	variety
cwt	hundredweight	m-equiv	milli-equivalent	vol.	volume
d-	deci-	m	molar	v/v	volume/volume
DE	dextrose equivalent	m	molar concentration	w	watt
detn.	determination	M-	mega- [as in Mrad]	W.	West, Western, etc.
DFD	dark firm dry	max.	maximum	WHO	World Health Organization
diam.	diameter	min	minute [time]	w/v	weight/volume
dil.	dilute	min.	minimum	wk	week
DM	dry matter, Deutsche Mark	mol	mole	wt.	weight
DNA	deoxyribonucleic acid(s)	mol.wt.	molecular weight	yd	yard
dyn	dyne	m.p.	melting point	yr	year
E.	East, Eastern, etc.	MPN	most probable number	μ	micro-[as in g, m]
ECD.	electron capture detection	MS	mass-spectrometry	%	per centum
EDTA	ethylenediaminetetra- acetic acid	n-	nano- [10 <sup>-9</sup> , as in nm]	>	greater than
Eh	oxidation-reduction potential	N	Newton [kg m/s <sup>2</sup> ]	≥	greater than or equal to; not less than
ELISA	enzyme-linked immunosorbent assay	N.	North, Northern, normal concentra- tion	<	less than
f-	femto- [10 <sup>-15</sup> , as in fCi]	NMR	nuclear magnetic resonance	≤	less than or equal to; not greater than
°F	degree Fahrenheit	NPU	net protein utilization		
FAO	Food and Agricul- tural Organization	oz	ounce		
FDA	Food and Drug Administration	p-	pico- [10 <sup>-12</sup> , as in pCi]		
FID	flame ionization detection	P	poise		
fl oz	fluid ounce	Pa	probability Pascal [N/m <sup>2</sup> ]		
f.p.	freezing point	PAGE	polyacrylamide gel electrophoresis		
		PER	protein efficiency ratio		
		p.p.b.	parts per billion		
		p.p.m.	parts per million		
		PSE	pale soft exudative		
		PTFE	polytetra- fluorethylene		
		PVC	polyvinyl chloride		

Chemical symbols are used  
for all elements.

## ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	Es
Swedish	Sv

§§§§



## GENERAL

- 728 Anon. Glass contamination: is there an answer. Food Manufacture 64(10); 1989; 55, 57-58

Contamination of food products with glass and its detection is discussed. BV

- 729 Jeffery (MS). On-line quality control. Maintaining standards in manufacturing. Manufacturing Confectioner 69(6); 1989; 123-126

The three main elements of a successful quality programme, namely establishing and communicating commercial standards, controlling product quality and quality auditing are discussed briefly. SYR

- 730 Roy (SK). Post-harvest handling, storage, and transportation of fruits and vegetables. Beverage & Food World 16(1); 1989; 40-41

This article deals briefly on handling, storage (refrigeration; -cool store, ice bank cooler), controlled/modified atm., hypobaric, waxing, polymeric film, chemicals, irradiation, evaporative cooling-cool chambers; and transportation of fruits and vegetables. SRA

- 731 Srivastav (PP), Sitaram Prasad and Das (H). Some traditional foods prepared from roasted grains. Beverage & Food World 16(1); 1989; 50-52

The preparation of traditional ready-to-eat foods and their uses have been summarised. Covers food products, flattened products, raw materials (paddy, Bengal gram, maize, jowar) equipment and appliances, roasted/puffed products, processing of paddy, conditioning, preheating and roasting/puffing and roasted grain powder. SRA

- 732 Tajima (M), Ishima (T), Ohtsuka (Y) and Tamaki (Y). The database system of chemical substance related to food fields. Journal of Japanese Society of Food Science and Technology '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 502-507 (Ja).

New database system of information of chem. substances related to food processing was developed. The system function was designed and application softwares were developed. The host computer system was ACOS-850, and DATA-170 was used as DBMS (Database Management System). The outline of the database is as follows. It includes physical data, spectral data, biological data, production and shipment data and legal data of food additives, enzymes and microbial products. Text data are written in Japanese. The software program to exchange the data between this database and other ones which were controlled by IBM system was also developed. AS



- 733 Vink (W). Quality auditing. *Manufacturing Confectioner* 69(6); 1989; 111-114

The four types of quality audits which are essential to a product's success are described. These are factory audits, consumer complaint audits, field audits and vendor audits. SYR

- 734 Warnecke (MO). Total quality and the future. *Manufacturing Confectioner* 69(6); 1989; 117-120

The article describes all aspects of total quality programme of a company. A total quality programme should be company's long range plan. The quality improvement in all areas can be accomplished by monitoring the process, identifying problems, identifying causes and implementing corrective action. SYR

## FOOD PROCESSING

### Extrusion

- 735 Guzman (GJ), Murphy (PA) and Johnson (LA). Properties of soybean-corn mixtures processed by low-cost extrusion. *Journal of Food Science* 54(6); 1989; 1590-1593

Ground soybeans and corn at ratios 60:40, 70:30, 80:20, and 100:0 soybean:corn were extruded with an Insta Pro 600 extruder. Initial moisture content was adjusted to 10%. Extruder exit temp. were 127, 138, 149 and 160 C. Soybean trypsin inhibitor activity was destroyed 48.9 to 98.8% as exit temp. increased. Extrusion temp. had no major effect on the tocopherol isomers. Lipxygenase was completely inactivated by extrusion. In vitro protein digestibilities of samples extruded at 127 C were significantly lower than samples extruded at higher temp. Residual lipase activity ranged from 2.7 to 63.7 micromoles  $H^+$   $min^{-1} \cdot g^{-1}$ . AS

### Extrusion cooking

- 736 Smith (A). Extrusion cooking. A review. *Food Science & Technology Today* 3(3); 1989; 156-161

Review covers equipment, combination of textures, functional properties, products (confectionery), nutrition, starches and fibres. BV

## FOOD PACKAGING

### Packaging materials

- 737 Iwata (T). Function of food container package and functional packaging material. *Packaging Japan* 10(49); 1989; 40-43



Review describes meaning of function, function of container package, way of thinking as to food hygiene law and functional packaging material. SRA

- 738 Singh (R). Glass containers-ideal packaging media for food and pharmaceutical products. Beverage & Food World 16(1); 1989; 55

Packaging industry, packaging for food preservation, humidity, light, glass containers, measures needed for reducing the cost of glass containers (excise duty exemption, technology upgradation) are briefly covered. SRA

#### FOOD ENGINEERING AND EQUIPMENT

- 739 Greener (IK) and Fennema (O). Barrier properties and surface characteristics of edible, bilayer films. Journal of Food Science 54(6); 1989; 1393-1399

Various formulation and method of fabricating a film consisting of edible hydrocolloids, and lipids were investigated. Two formulation consisting of a methylcellulose base layer and a beeswax layer, deposited either from a molten state (Wax-M film) or from an ethanolic solution (Wax-S film), were examined for water vapour permeability (WVP) oxygen permeability and other physical properties. WVP values ( $\text{g.mil.m}^{-2} \text{ day}^{-1} \text{ mm Hg}^{-1}$ ) for the Wax-M and Wax-S films were 0.5 plus or minus 0.05 and 1.6 plus or minus 0.4 resp. WVP of the two films did not change significantly after storage for 1 wk at  $-40^\circ \text{C}$ . Oxygen permeability values ( $\text{g.cm.cm}^{-2} \text{ sec}^{-1} \text{ mm Hg}^{-1} \times 10^{-12}$ ) for the Wax-M and Wax-S films were 0.021 plus or minus and 0.007 plus or minus 0.002, resp. The Wax-M film had a more uniform surface topography than the Wax-S film. AS

- 740 Holberger (NK). Continuous cooking with automatic controls. Manufacturing Confectioner 69(10); 1989; 77-79

The paper describes briefly the automatic controls of the pre-heating, final cooking and vacuuming of high boil syrups. SYR

- 741 Iglesias (HA), Chirife (J) and Fontan (CF). On the temperature dependence of isosteric heats of water sorption in dehydrated foods. Journal of Food Science 54(6); 1989; 1620-1623, 1631

The usual procedures for calculating isosteric heats of sorption by the application of the Clausius-Clapeyron equation (e.g. sorption isosteres or the integrated form) to isotherms at different temp., was examined. For almost all foods studied the magnitude of the heat curves seemed to be dependent on the temp. interval used for its calculation. However for some foods the relative differences in the isosteric heat curves were much more marked than in others. The observed behaviour may be tentatively attributed to changes occurring in foods subjected to increased temp. in the "semi-dry" or "dry"



state. These changes may be identified with among others cross-linking and denaturation of proteins, non-enzymatic browning reactions and the like. AS

### Engineering

- 742 Bhattacharrya (AKM) and Padmanabhan (M). Modelling flow in cylindrical extruder dies. *Journal of Food Science* 54(6); 1989; 1584-1589

Volumetric flow rate was studied in the die of a single screw extruder. Variables included the ratio of die length to die diameter, barrel to die diameter, barrel and die temp., screw speed and product moisture. Die conductance was determined graphically and analytically. Results indicated that for a constant pressure drop across the die, increasing temp. die diameter or moisture increased flow rate. Dimensional analysis was used to study the effect of each parameter on the flow through the extruder die. An expression for temp. rise due to viscous dissipation for isothermal flow in the die was developed and monographs are presented. AS

- 743 Greener (IK) and Fennema (O). Evaluation of edible, bilayer films for use as moisture barriers for food. *Journal of Food Science* 54(6); 1989; 1400-1406

Two edible, bilayer films, consisting of methylcellulose (MC) and polyethylene glycol 400 in the hydrocolloid layer, and beeswax, either applied molten (Wax-M film) or from an ethanol solution (Wax-S film), in the lipid layer, were evaluated as barriers to water vapour (WV) after abusive tests. The Wax-M film maintained its WV barrier properties better than the Wax-S film. The Wax-M film was also evaluated as a moisture barrier when formed in place on the surface of brownies. When brownies were stored at 100% relative humidity and 25 C, the Wax-M film significantly ( $P < 0.05$ ) decreased moisture absorption as compared to that of control samples. AS

- 744 Lakritz (L) and Maerker (G). Effect of ionizing radiation on cholesterol in aqueous dispersion. *Journal of Food Science* 54(6); 1989; 1569-1572

Aqueous sodium stearate dispersion of cholesterol were irradiated at 0-2 C with absorbed doses ranging from 2.5 to 50 kGy. The resulting mixture of cholesterol derivatives was isolated and examined for 7 ketocholesterol and cholesterol 5 alpha-6alpha-epoxide and 5 beta, 6 beta-epoxide content. Conc'n. of all three compounds increased with dose, while the ratio of 7-ketocholesterol to total epoxides decreased with increasing dose. The ratio of 7-ketocholesterol to the epoxides was approx. 1 or below at all dose levels while the same ratio in autoxidations of cholesterol in dispersions was normally 6 or greater. The change in the keto/epoxide ratio may be a means for determining whether meat or other foods containing cholesterol have been subjected to ionizing radiation. AS



- 745 Lebowitz (SF) and Bhowmik (SR). Determination of retortable pouch heat transfer coefficients by optimization method. *Journal of Food Science* 54(6); 1989; 1407-1412

A computer-based optimization technique was developed for determining the apparent heat transfer coeff. (h) for retortable pouches heated by circulated hot water were overriding air pressure. The technique incorporated actual process data, a finite differences model and an optimization criteria to converge on h values. A water flow channel was constructed to fit inside a vertical retort which allowed direct water exposure on the pouch surface at a quantifiable velocity. Because the optimization technique was not dependent on analytical equations, it could be applied to such areas as future heat transfer studies of new retortable pouch materials, designing new pouch-holding cassettes and improving water flow patterns in retorts. AS

- 746 Weintraub (SE), Ramaswamy (HS) and Tung (MA). Heating rates in flexible packages containing entrapped air during overpressure processing. *Journal of Food Science* 54(6); 1989; 1417-1421

Experiments were performed in two steam/air retorts and one water immersion retort to test the influence of included air on heating rate index (f) values at the centre of thin plastic bricks packaged in retort pouches and processed under various temp. and overpressure conditions. In general, high air overpressures (> 80 kPa) allowed up to 30 mL air to be included with no detrimental effect on heating rates; however, even small amounts of entrapped air (< 5 mL) degraded heat transfer when processed at low air overpressures (< 40 kPa). Processing medium and retort type were important factors in the sensitivity of heating rate to increases of air vol. beyond a threshold value. AS

#### Drying

- 747 An-Erl King (V), Zall (RR) and Ludington (DC). Controlled low-temperature vacuum dehydration. A new approach for low-temperature and low-pressure food drying. *Journal of Food Science* 54(6); 1989; 1573-1579, 1593

The processes of free-drying, vacuum drying and controlled low-temp. vacuum dehydration (CLTV) were used to dry clam paste and gelatin-microcrystalline cellulose model food system. CLTV was carried out as cold as possible without freezing the product. Much less drying time was required for CLTV and vacuum drying than for freeze-drying. The mass transfer resistance for both freeze-drying and CLTV was less than that of vacuum drying. Functional properties were closer to those of freeze-drying than to vacuum drying. CLTV versus freeze-drying showed a 30% reduction in enthalpy change and 40% reduction in running cost. Microbiological analysis used to monitor the safety of processing clam paste, showed that the process was satisfactory relative to common parameters. AS

## ENERGY IN FOOD PROCESSING

Nil

## FOOD CHEMISTRY AND ANALYSIS

## Chemistry

- 748 Huang (T-C), Bruechert (LJ) and Ho (C-T). Kinetics of pyrazine formation in amino acid-glucose systems. *Journal of Food Science* 54(6); 1989; 1611-1614

The chemistry and kinetics of pyrazine formation were studied in four amino acid-glucose model system. Different amounts of the same alkylpyrazines were produced in the four systems. The most abundant alkylpyrazine generated in a glycine-glucose system was 2,3,5-trimethylpyrazine, while 2-methylpyrazine was most abundant in an arginine-glucose system and 2,5-dimethylpyrazine predominated in a histidine-glucose system. 2-methylpyrazine and 2,5-dimethylpyrazine were the two most abundant alkylpyrazines in a lysine glucose system. Kinetic data from the arginine-glucose system indicated that each of four selected pyrazines was formed by a pseudo-zero-order reaction. Activation energies in the same system were determined to be 19.5 plus or minus 4.1 Kcal mole for pyrazine, 24.8 plus or minus 8.7 Kcal Mole for 2-methylpyrazine, 20.8 plus or minus 4.7 Kcal Mole for 2,6-dimethylpyrazine and 29.0 plus or minus 3.8 Kcal Mole for 2-methyl-6, 7-dihydro-5H-cyclopyrazine. AS

- 749 Velisek (J), Davidek (T), Davidek (J), Trska (P), Kvasnicka (F) and Velcova (K). New imidazoles formed in non-enzymatic browning reactions. *Journal of Food Science* 54(6); 1989; 1544-1546

1,3-Bis (carboxymethyl)imidazole was identified in a model reaction mixture derived from glycine, glyoxal, and formaldehyde. The same compound was also found in the reaction of glycine with glyoxal. The structure of this compound was elucidated from the measured mol., mass and <sup>1</sup>H-NMR and <sup>13</sup>C-NMR spectral data and confirmed by X-ray crystallographic measurements. Similarly, a 2-methyl-, 4-methyl-, and 2,4 dimethyl-1,3-bis (carboxymethyl)-imidazole were formed in reactions of glycine with glyoxal or methylglyoxal and formed in reactions of glycine with glyoxal or methylglyoxal and formaldehyde or acetaldehyde. These 1,3-symmetrically substituted imidazoles represent quite a new group of N-containing heterocyclic compounds originating in model systems containing amino acids and alpha-dicarbonyl compounds and probably also in natural systems. AS



## Chemistry (Analytical)

- 750 Park (PSW) and Addis (PB). Derivatization of 5 $\alpha$ -cholestane-2, 3, 6 Beta-triol into trimethylsilyl ether sterol for GC analysis. *Journal of the American Oil Chemists' Society* 66(11); 1989; 1632-1634

Chemical identity of 5 $\alpha$ -cholestane-3-Beta-5,6Beta-triol (C-Triol) as a trimethylsilyl (TMS) ether derivative was studied using gas chromatography (GC) mass spectrometry (MS), and proton nuclear magnetic resonance (NMR) spectroscopy. The derivatization mixtures, held at 23 °C for 30 and 300 min, showed only a single peak (B) by GC. When the mixture was heated at 70 °C for a few hours, another peak (A) emerged ahead of peak (B). GC-MS analysis revealed that the GC peaks (A) and (B) are C-Triol as tris and bis-TMS ether derivatives, resp. NMR analysis suggested that the hydroxyl groups at C<sub>3</sub> and C<sub>6</sub> of C-Triol were involved in the formation of the bis-TMS ether. AS

## FOOD MICROBIOLOGY AND HYGIENE

- 751 Park (YS), Ohtake (H), Toda (K), Fukaya (M), Okumura (H) and Kawamura (Y). Acetic acid production using a fermentor equipped with a hollow fiber filter module. *Biotechnology and Bioengineering* 33(7); 1989; 918-923

The continuous production of acetic acid by *Acetobacter acetii* M23 was carried out using a fermentor equipped with a hollow fiber filter module. The culture continued for 830 h with various dilution rates, which were changed stepwisely from low to high. The final cell concn. was 21.9 g dry cell/L and the max. productivity of acetic acid was 12.7 g/L.h for the exit acetic acid concn. of about 50 g/L. The productivity was higher than any literature's values surveyed so far. The cell concn. was 62.8 times and the productivity was 4.6 times as high as those of the fermentor without the filter module. The productivity increased with the increase of dilution rate up to 0.3 h<sup>-1</sup>. It is interesting to note that the viable cell concn. was kept almost constant about  $1.1 \times 10^7$  cells/mL in spite of the increase of dilution rate. Use of oxygen rich air was indispensable to establish the high productivity of acetic acid. AS

## Enzymes

## Amylases

- 752 Udupa (SL), Prabhakar (AR) and Tandon (S). Alpha-amylase inhibitors in foodstuffs. *Food Chemistry* 34(2); 1989; 95-101

The incidence of dental caries in children of South Karnataka is very high. An important etiological factor influencing the development of caries is the type of food consumed. Salivary amylase

exerts a protective effect over teeth by hydrolysing large polysaccharide molecules left in the oral cavity which could otherwise serve as a matrix to encompass bacteria and result in tooth decay. Inhibitors of alpha-amylase present in these foodstuffs can therefore reduce this protective effect. The inhibition of salivary alpha-amylase of a group of 10 school children by some of the most commonly consumed local foodstuffs was studied. Rice preparations (rice idli, rice gruel and boiled rice), fish fry and banana did not have any effect on salivary amylase activity. A statistically significant effect was observed with the sweet preparations (kadla payisa and kesari baath), and the fried foods (potato chips and groundnuts). Inhibition by other foodstuffs (dosa, idli and upma) was slight and not significant. Considerable variations in basal amylase activity and susceptibility of alpha-amylase of individuals to inhibition by particular foodstuffs were also observed. It is possible that some component in saliva may be able to moderate the action of the inhibitor in resistant individuals. AS

#### Glucoamylases

- 753 Saha (BC) and Zeikus (JG). Microbial glucoamylases. Biochemical and biotechnological features. Starch/Stärke 41(2); 1989; 57-64

A comprehensive review has been presented on microbial glucoamylase, which is one of the most important industrial enzymes. The aspects covered include the occurrence and production of various types of glucoamylases, their multiplicity, molecular characteristics, action pattern on soluble and insoluble substrates, thermal stability and various industrial uses. 186 references. SZA

#### Ethyl alcohol

- 754 Mistry (FR) and Cooney (CL). Production of ethanol by *Clostridium thermosaccharolyticum*. II. A quantitative model describing product distribution. Biotechnology and Bioengineering 34(10); 1989; 1305-1320

A study of the continuous culture of *Clostridium thermosaccharolyticum* on xylose showed multiple steady states and hysteresis. A quantitative model based on the biochemistry and physiology of xylose fermentation by *C. thermosaccharolyticum* was developed. The objective in developing this model was to bring together the observations both of this study and of other researchers on the fermentation of xylose. The model equations were written based on the metabolic pathway for xylose utilization by *C. thermosaccharolyticum* and the requirement that the carbon, ATP and NADH within the cell be balanced. Given the specific growth rate  $\mu$  and the specific xylose utilization rate  $q$ , a set of product distributions (ethanol, acetate, and lactate) satisfying these balances was obtained. This set was plotted on a triangular plot and named the permitted region. The product distributions within this permitted region were shown to be affected by the environmental parameters such as Fe concn. and hydrogen partial pressure. The model predicted trends in product distribution which correlate with experimentally observed phenomena.



The model was also used to analyze the continuous-culture data from our experimental work. AS

- 755 Mistry (FR) and Cooney (CL). Production of ethanol by *Clostridium thermosaccharolyticum* I. Effect of cell recycle and environmental parameters. *Biotechnology and Bioengineering* 34(10); 1989; 1295-1304

The direct microbial conversion (DMC) process for the production of ethanol from lignocellulosic biomass is limited by low volumetric ethanol production rates due to the low cell densities of *Clostridium thermosaccharolyticum* which is a key organism for ethanol production in this process. Hence, this study focuses on the use of a continuous-culture cell recycle system to improve the volumetric ethanol productivity and yield of the fermentation of xylose by *C. thermosaccharolyticum*. Early exp. with the continuous-culture cell recycle system showed a two-fold improvement in volumetric ethanol productivity. However, the ethanol yield at the higher dilution rates suffered because of the large amount of lactate produced. The manipulation of two environmental parameters-iron concn. in the nutrient medium and nitrogen purge rate of the fermentor headspace-allowed a dramatic reduction in the lactate production and a simultaneous improvement in the ethanol titer and yield. Under the improved conditions of increased iron concn. (12.5 mg/L ferrous sulphate) and decreased nitrogen purge rate (0.1 L/min), a continuous culture of *C. thermosaccharolyticum* operating at a dilution rate of 0.24 h<sup>-1</sup> and 50% cell recycle produced 8.6 g/L ethanol and less than 1 g/L each of acetate and lactate. The volumetric ethanol productivity was 2.2 g/L/h, which is 8 times larger than obtained for a continuous culture operated with no cell recycle and the same specific growth rate. AS

#### Fermented foods

##### Tempeh

- 756 Ashenafi (M) and Busse (M). Inhibitory effect of *Lactobacillus plantarum* on *Salmonella infantis*, *Enterobacter aerogenes* and *Escherichia coli* during tempeh fermentation. *Journal of Food Protection* 52(3); 1989; 169-172

Growth and inhibition of *Salmonella infantis*, *Enterobacter aerogenes* and *Escherichia coli* in fermenting soybeans during tempeh production were studied in presence and absence of *Lactobacillus plantarum*. In fermenting unacidified soybeans *S. infantis* grew by 7 log units in 40 h. *E. coli* and *E. aerogenes* grew by 6 and 7 log units resp. A similar pattern of growth of the three test organisms in fermenting acidified beans was also noted. Further inoculation of unacidified cooked beans with *L. plantarum* at a level of 10<sup>6</sup> /g resulted in a complete inhibition of the test organisms in the product. On acidified cooked beans a lower level of *L. plantarum* inoculum (10<sup>5</sup> /g) was enough to show a complete inhibitory effect. The lowering of the pH in fermenting beans by *L. plantarum* might have played a role in the destruction of the test organisms. AS

## Microorganisms

## Bacteria

*Bacillus cereus*

- 757 Angles Mosso (M), Luisa Garcia Arribas (M), Cuena (JA) and Carmen De La Rosa (M). Enumeration of *Bacillus* and *Bacillus cereus* spores in food from Spain. *Journal of Food Protection* 52(3); 1989; 184-188

The *Bacillus* and *B. cereus* spore population of 102 samples of food (salad dressing, dried soups, sweet desserts, milk and milk products, rice dishes, pasta and flour), 93 collected from retail market of Madrid and 9 from Chinese restaurants have been studied. *Bacillus* spores were detected in 82.4% of the samples. While the incidence of *B. cereus* spores was 14.7%. In salad dressing and dried soups the contamination rate by sp. of *Bacillus* was 100% and also both showed the highest contamination of *B. cereus* spores (25% and 50% resp.). No samples of rice dishes and pasta exhibited *B. cereus* spore contamination although these were contaminated by other *Bacillus* sp. AS

*Clostridium perfringens*

- 758 Jong (Jde). Spoilage of an acid food product by *Clostridium perfringens*, *C. barati* and *C. butyricum*. *International Journal of Food Microbiology* 8(2); 1989; 121-132

Spoilage of canned pasteurized brined mung bean sprouts, acidified with citric acid to pH 4.0-4.5, was found to be caused by acid tolerant *Clostridium* spp. including the sp. *barati*, *perfringens* and *butyricum*. The pH limit for growth in the brine used were estimated 3.7, 3.7 and 4.0 resp. Some of the isolated *C. perfringens* strains produced enterotoxins in sporulation media. The spores of the isolated anaerobes appeared to originate from mung beans, but *C. barati* and *C. perfringens* strains freshly isolated from dry beans, the oxygen concn. decreased, while carbon dioxide concn. increased considerably, due to respiration of the sprouts and actively growing *Enterobacteriaceae* and *lactobacilli*. It was assumed that this allowed *C. barati* and *C. perfringens* strains to grow and acquire the observed unusual acid tolerance. After increasing aerobicity during sprouting, no growth of *Clostridium* spp. was observed, substantiating the assumption. AS

## Listeria

- 759 Pusch (DJ). A review of current methods used in the United States for isolating *Listeria* from food. *International Journal of Food Microbiology* 8(2); 1989; 197-204

Two cultural and two rapid *Listeria* isolation procedures used in the United States is reviewed in this presentation. AS



*Listeria monocytogenes*

- 760 Farber (JM). Thermal resistance of *Listeria monocytogenes* in foods. *International Journal of Food Microbiology* 8(2); 1989; 285-291

Recent studies on the heat resistance of *Listeria monocytogenes* in dairy products, the discrepancies in results and some of the difficulties involved in comparing interlab. exp. are reviewed. In addition, some current work on the thermal resistance of the organism in meat products is discussed. AS

- 761 Mossel (DAA). *Listeria monocytogenes* in foods. Isolation, characterization and control. *International Journal of Food Microbiology* 8(2); 1989; 183-195

The intent for examining foods for *Listeria monocytogenes* i.e., surveying for epidemiological purposes, or to inspect consignments of foods for microbiological safety, determines which analytical method is to be used. For instance resuscitation of debilitated cells may be required, and the degree of accuracy and precision necessary should be considered. Moreover, in the case of acceptance-or-rejection monitoring target values for 'absence' of the pathogen have been amply but not always effectively discussed. Recommendations are given for assessing adequate repair of sublethally damaged populations of *L. monocytogenes* and for performance testing of selective enrichment and isolation media to be used for the isolation and enumeration of *L. monocytogenes*. An approach to the empirical assessment of reference values for *L. monocytogenes* in foods processed for safety is also presented. This relies on a data base of results obtained when examining foods manufactured and distributed according to practices previously validated by longitudinally integrated ('holistic') quantitative risk analysis. AS

*Salmonella*

- 762 Metrick (C), Hoover (DG) and Farkas (DF). Effects of high hydrostatic pressure on heat-resistant and heat-sensitive strains of *Salmonella*. *Journal of Food Science* 54(6); 1989; 1547-1549, 1564

*Salmonella senftenberg* 775W, a heat-resistant strain ( $D_{57.5\text{ }^{\circ}\text{C}} = 15.0\text{ min}$ ) and *Salmonella typhimurium* ATCC 7136, a heat-sensitive strain ( $D_{57.5\text{ }^{\circ}\text{C}} = 3.0\text{ min}$ ) were subjected to hydrostatic pressures of 2,380 to 3,400 atm. at 23 °C in phosphate buffer (63 mM, pH 7.0) and chicken medium (strained baby food). Survivor curves showed that cell death occurred in this pressure range and increased as pressure increased. Death was greater in buffer than in the chicken medium. *S. senftenberg* 775 was more sensitive to pressure than *S. typhimurium* 7136. Injury occurred over the range of pressures for both sp. Recovery at 37 °C was possible following pressurization for salmonellae in chicken but not in buffer. AS



*Staphylococcus aureus*

- 763 Shelef (LA) and Wang (Z-L). Effects of polyphosphates on cell numbers, enterotoxin A, and extracellular protein in *Staphylococcus aureus* 196E. *Journal of Food Science* 54(6); 1989; 1550-1552

Effects of sodium salts of pyro-(SAPP), tripoly- (STPP), and hexametaphosphate (SHMP) on cell numbers, enterotoxin A (SEA) and extracellular protein production (ECP) of *Staphylococcus aureus* strain 196A were studied in 4% N-Z amine broth plus 1% yeast extract after 24 h at 30 C. At pH 7.0, concn. lower than 56 mM (1.2%) SAPP, 27 mM (1%) STPP or 3 mM (0.4%) SHMP had no antibacterial effects and a bacteriostatic effect showed at slightly higher concn. SAPP was the least effective inhibitor at neutral pH, but displayed enhanced inhibitory effects at pH 5.5. Reduction in SEA and ECP paralleled cell growth suppression; their concn. were 1400 ng/mL and 1.5 mg/mL, resp. In phosphate free broth ( $9 \times 10^9$  CFU/mL), and non-detectable when cell numbers were less than or equal to  $10^6$  per mL. AS

## Fungi

*Aspergillus*

- 764 Ogundero (VW). The activities of partially purified acid proteases of thermotolerant *Aspergillus* species from post harvest oil plant kernels. *Nahrung* 33(3); 1989; 253-260

The production and activities of extracellular acid proteases of *Aspergillus fumigatus* Fres. and *Aspergillus nidulans* (Eidam) Wint were studied. Both sp. grew readily on the palm kernel oil-peptone medium resulting in peak protease production and biomass accumulation occurring within the incubation period of 10 days. Partial purification of the crude protease from the culture filtrate of *A. fumigatus* on DEAE-cellulose and on Sephadex G-200 gave a single active protease peak being eluted with the protein from at  $A_{280}$ . A 47-fold purification was achieved with a recovery value of 2.1%. The specific activity (22.4 U/mg protein) of *A. fumigatus* protease was much higher than that of *A. nidulans* protease (11.4 U/mg protein). Also, *A. fumigatus* protease was most active at 40 C and pH 5.8 on casein and on gelatin. *A. nidulans* protease acted best at 45 C and pH 5.4 on similar substrate. The proteases from both fungi showed no exoprotease activity when used to hydrolyze leucine amide, hippuryl phenylalanine and hippuryl arginine. AS

## Mushrooms

- 765 Beelman (RB), Witowski (ME), Doores (S), Kilara (A) and Kuhn (GD). Acidification process technology to control thermophilic spoilage in canned mushrooms. *Journal of Food Protection* 52(3); 1989; 178-183

Alternative processes involving the use of citric acid and or EDTA in mushroom canning operations were evaluated and compared to a standard commercial process as means to control thermophilic spoi-



lage. An average of 68% thermophilic spoilage was observed with the standard control process. Spoilage was reduced to an average of 23.9% by the addition of citric acid to the can brine, and to 16.8% when 500 p.p.m. EDTA was also added to the can brine. However, the best results, 2.4% average spoilage, were observed when mushrooms were vacuum hydrated in a buffered citric acid solution (0.05 M, pH 3.5) and EDTA was added to the can brine at 200 p.p.m. equilibrium concn. This treatment was as the Acid-Vacuum Hydration-Chelation (A-VH-C) process. Bacteriological evaluation indicated that the A-VH-C Process caused no significant reduction in product spore load counts (after blanching) compared to the control, but did reduce spore load counts after thermal processing. However, cans from all treatments contained viable spores. Outgrowth studies conducted with spores that survived thermal processing and inoculated into Beef Extract Tryptone Iron (BETI) both indicated that spores from cans processed with the A-VH-C Process had the longest generation time. Similar exp. where the BETI broth was treated to simulate the conditions in the cans indicated that the addition of EDTA to the medium had the greatest effect on reducing outgrowth rate of surviving spores. AS

- 766 Hollman (PCH), de Jong (WJHJ), Venema (DP), Van Postrum (S) and Herstel (H). Detection of water-binding activities in canned mushrooms. Zeitschrift fur Lebensmittel-Untersuchung und -Forschung 188(4); 1989; 337-342

Since 1 October 1987 the use of additives to prevent too much shrinkage of preserved mushrooms has been prohibited in the Netherlands. Therefore, methods have been developed to control canned mushrooms for the presence of these water-binding additives (e.g. egg-white, starches, gums, alginates). Physical methods (viscosity, filtration, flow rate) tentatively studied did not give sufficiently reliable results. Microscopic, immunochemical and chromatographic method were more successful. These methods were developed using reference samples of canned mushrooms with various water-binding agents and were finally tested with blind samples. The methods developed proved to be complementary. With microscopical methods starches can be detected by staining but, among other, alginates are indistinguishable from proteins using a staining technique. Other additives, such as guar gum and microcrystalline cellulose, can be morphologically identified using microscopy. An immunoblot method for the detn. of ovalbumin was adopted in order to determine small amounts of ovalbumin in the surrounding liquid of the mushrooms. The presence of polysaccharides containing water-binding additives such as alginates, pectins and xanthan gum can be detected with gel permeation chromatography is necessary but is hindered by a naturally occurring polysaccharide in the mushrooms. AS

- 767 Pryke (P). Mushroom packaging. Present and future. Mushroom Journal 196,; 1989;



## Hygiene

## Acinetobacter

- 768 Lewis (SJ), Gilmour (A) and Johnston (DE). Factors influencing the detachment of a polymer-associated *Acinetobacter* sp. from stainless steel. *International Journal of Food Microbiology* 8(2); 1989; 155-164

The role of an extracellular polymer secreted by an *Acinetobacter* sp. attached to stainless steel was investigated. Parameters expected to influence polymer conformation, viz. temp. pH, ionic strength and the concn. of Ca and Mg ions, were altered and the resulting detached bacteria enumerated. Increasing both the temp. and pH resulted in increased number of bacteria detached. The effects of increasing the concn. of sodium chloride up to 100mM and magnesium or calcium chloride up to 30 mM were small and, although statistically significant, were considered unlikely to have had major influence on the association of the bacteria with the stainless steel surfaces. Treatments including ultraviolet irradiation of surface-associated bacteria always resulted in removal of greater numbers of bacteria when compared to treatments where irradiation was not employed. The results indicate that an adhesive extracellular acidic polysaccharide may mediate the attachment of the *Acinetobacter* sp. to stainless steel. AS

*Listeria monocytogenes*

- 769 Conner (DE), Scott (VN), Sumner (SS) and Bernard (DT). Pathogenicity of foodborne, environmental and clinical isolates of *Listeria monocytogenes* in mice. *Journal of Food Science* 54(6); 1989; 1553-1556

Foodborne, environmental and clinical isolates of *Listeria monocytogenes* and other *Listeria* sp. were screened for pathogenicity in immunocompromised mice. 218 isolates of *L. monocytogenes*, 203 were pathogenic and 15 were non-pathogenic. All non-*monocytogenes* sp. were non-pathogenic. Pathogenic isolates were hemolytic for sheep blood. In contrast, many non-pathogenic isolates were weakly hemolytic, but were CAMP positive. Lethal doses ( $LD_{50}$ ) of pathogenic isolates were 5-480 cells for immunocompromised mice and  $7.2 \times 10^5$  to  $8.4 \times 10^7$  for non-immunocompromised mice; whereas  $LD_{50}$  for non-pathogenic isolates were  $> 10^8$  cells in both immunocompromised and non-immunocompromised mice. Selected test isolates of *L. monocytogenes* were serotyped; the most common serotypes were 1/2b, 1/2a, 3a and 4b. The initial source and serotype of the isolate appeared not to be related to pathogenicity in immunocompromised mice. However, hemolytic activity was related to pathogenicity. AS

- 770 Junttila (J), Hirn (J), Hill (P) and Nurmi (E). Effect of different levels of nitrite and nitrate on the survival of *Listeria monocytogenes* during the manufacture of fermented sausage. *Journal of Food Protection* 52(3); 1989; 158-161

The fate of *L. monocytogenes* during the fermentation of Finnish



fermented sausage was examined *L. monocytogenes* was able to survive during a 21 d fermentation of sausage with levels of nitrite and salt commonly used in the meat industry today (120 p.p.m. sodium nitrate and 3.0% NaCl). Initial number of *Listeria* ( $10^6$  CFU/g and  $10^7$  CFU/g) decreased approx. 1 log  $10^6$  CFU/g during the manufacture. Increasing the levels of nitrite/nitrate to those used 30 yrs ago in meat products had a marked effect on the elimination of *Listeria*. The number of survivors in the sausages was reduced 2.0 log  $10^6$  CFU/g during the fermentation of 3 wks with a combination of 200 p.p.m. sodium nitrate and 300 p.p.m. potassium nitrate with 1000 p.p.m. potassium nitrate, the decrease was 3.3 log  $10^6$ /CFU/g. *L. monocytogenes* could not be totally eliminated from highly contaminated sausage by increasing only the levels of nitrite and nitrate. Levels of these additives with best bacteriostatic effect on *Listeria* are no longer permitted in food. AS

### BIOTECHNOLOGY

- 771 Belfort (G). Membranes and bioreactors. A technical challenge in biotechnology. *Biotechnology and Bioengineering* 33(8); 1989; 1047-1066

Integrating the properties of synthetic membranes with biological catalysts such as cells and enzymes forms the basis of an exciting new technology called membrane bioreactors. The impetus behind this marriage comes from the recent spectacular advances in recombinant DNA and cell fusion technologies and the need to develop competitive bioprocessing schemes to produce complex and active biological molecules. The advantages and limitations of using membrane bioreactors for entrapping whole cells and enzymes are reviewed. Various membrane configurations such as microcapsules, hollow fibers, and flat sheets are compared. Several different entrapped membrane bioreactors, including single, laminated and microporous, for the conversion of optically active enantiomers are described. As with new and exciting technologies, the future of membrane bioreactors in biotechnology will depend on their ability to produce desired molecules at competitive costs. AS

### TISSUE CULTURE

- 772 Watanabe (A). The terminology related to membrane technology. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 525-529 (Ja).



## FOOD ADDITIVES

## Antimicrobials

- 773 Tiina (M) and Sandholm (M). Antibacterial effect of the glucose oxidase-glucose system on food-poisoning organisms. International Journal of Food Microbiology 8(2); 1989; 165-174

The antibacterial effect of the glucose oxidase-glucose system was studied on food-poisoning organisms including *Staphylococcus aureus*, *Salmonella infantis*, *Clostridium perfringens*, *Bacillus cereus*, *Campylobacter jejuni*, *Listeria monocytogenes* and *Yersinia enterocolitica* using automated turbidometry. The bacteria were grown in sterile-filtered meat medium which was either raw or heat-denatured. The results showed a clear growth inhibition with combinations of 0.5-1.0 mg/ml glucose and 0.5-1.0 IU/ml glucose oxidase. The growth inhibition was more effective in the heat-denatured meat medium. The most resistant pathogens were *Campylobacter jejuni* and *Listeria monocytogenes* however, growth inhibition was still evident. The possible application of the glucose oxidase-glucose system in food products inhibiting the growth of pathogens and spoilage organisms is discussed. AS

## Colourants

## Dyes

- 774 Meyer (RA), Grundig (F), Schafer (R) and Schneider (J). Analysis of synthetic organic food dyes by thin-layer chromatography. Nahrung 33(3); 1989; 261-268 (De).

After presenting a literature survey of the thin-layer chromatography of synthetic organic food dyes the separation of 17 food dyes on cellulose and silica-gel layers by the solvent systems n-propanol/water (67 + 33) and ethyl acetate/methanol/ammonia conc. (60 + 20 + 20) is described. The  $R_f$ -values and the detection limits of the individual dyes are given. The spectra of 7 red dyes and the calibration curves of cochineal red and true-red are plotted by means of the thin-layer scanner CS-910. AS

## Sweeteners

## Sucralose

- 775 Jenner (MR) and Smithson (A). Physicochemical properties of the sweetener sucralose. Journal of Food Science 54(6); 1989; 1646-1649

The physicochemical properties of the high intensity sweetener, sucralose, (1,6-dichloro-1,6-dideoxy-beta-D-fructofuranosyl 4-chloro-4-deoxy- $\alpha$ -D-galactopyranoside) were determined. A high solubility in water (28.3g/100 mL at 20 °C) in combination with Newtonian viscosity characteristics, a negligible lowering of surface tension,



and no pH effect demonstrated that sucralose was particularly suitable for use in liquid products. The refractive index of aqueous solutions was linear with respect to concn. confirming the usefulness of this technique for determining solution concn. A low octanol-water partition coeff. confirmed that sucralose was poorly soluble in lipids and was, therefore, likely to behave in a similar fashion to sugar in multiphase systems. AS

## CEREALS

### Oats

#### Oat flour

- 776 Guy (RCE), Janes (DA) and Nkwanyuo (WE). Extrusion cooking of oat flours. Flour Milling and Baking Research Association Bulletin 2; 1989;

Oat flour was largely unexpanded at low moisture levels, despite the transition to a molten state in the starch granules, because of lack of starch in the continuous phase. At high moisture levels, the increasing weakness in the starch granules after melting and swelling led to the formulation of a continuous starch phase and the retention of steam bubbles to form an expanded foam structure. The most favourable conditions for the direct expansion of cereals lies within the low moisture range (below 20% moisture) because the high starch concn. prevent collapse and shrinkage and the extrudates have low moisture contents. SRA

#### Oat proteins

- 777 Ma (C-Y), Campbell (C), Khanzada (G) and Modler (HW). Functional characteristics of Wiener-type products substituted with native and acid-hydrolyzed oat protein isolates. Journal of Food Science 54(6); 1989; 1450-1451

Wiener-type products containing 5, 10 and 20% oat protein isolates (OPI), acid-hydrolyzed OPI or legume proteins were prepared and compared to an all-meat control. Cook yields progressively decreased with increases in the level of substitution, but there was no significant differences ( $P < 0.05$ ) among samples containing the same amount of vegetable proteins. Wiener-type products containing acid-hydrolyzed OPI had significantly higher firmness and cohesiveness than those substituted with other vegetable proteins. AS

### Rice

- 778 Cogburn (RR), Hung (HH) and Webb (BD). Survival and development of *Sitotroga cerealella* (Olive.) on seeds from species of *Oryza* other than *Oryza sativa* L. Journal of Stored Products Research 25(3); 1989; 117-123



Fifty accession of wild *Oryza* spp (those other than *Oryza sativa* L.) were acquired and grown in pots to increase the seed. Physical and chemical characteristics of the seed were measured. The amylose content of most of the sp. of wild *Oryza* was high (> 23%) but all were within the range required for cvs rice. Gelatinization temp. also were within required ranges. Therefore, should any of these *Oryza* spp possess insect or disease resistance, general hardiness, cold-tolerance or other characteristics desirable for new var. of rice, the transfer may be made easier because the cooking quality characteristics (amylose and gelatinization temp. type) of these sp. being within ranges common in commercial var. of rice, would not require alteration. Resistance or susceptibility to *Sitotroga cerealella* (Oliver) was tested in wild *Oryza* spp. and in three var. of rice. Survival and developmental time from larvae to adult were the criteria used to assess resistance susceptibility. Insect performance was adversely affected by intact hulls and small seed size. The hull character in wild *oryza* is no stronger than that previously observed in rice and small seed size is not a viable option as a resistant base. A resistant character of *S. cerealella* that would justify an attempt to transfer the trait from one sp. to another apparently is not available in the accessions of wild *Oryza* that were tested. AS

- 779 Hussain (A), Scanlon (MG), Juliano (BO) and Bushuk (W). Discrimination of rice cultivars by polyacrylamide gel electrophoresis and high-performance liquid chromatography. *Cereal Chemistry* 66(4); 1989; 353-356

Two methods, polyacrylamide gel electrophoresis and reversed-phase high-performance liquid chromatography, were developed to discriminate 10 different cvs and an advanced line of rice (*Oryza sativa* L) on the basis of genotype-specific protein patterns. The proteins that were analyzed were extracted from ground brown rice with 5M acetic acid solution. AS

- 780 Jilani (G), Saxena (RC) and Khan (AA). Ethylene production as an indicator of germination and vigor loss in stored rice seed infested by *Rhyzopertha dominica* (F). (Coleoptera:Bostrychidae). *Journal of Stored Products Research* 25(3); 1989; 175-178

Germination and vigor of stored "Taichung Native 1" (TN1) rice seed was significantly reduced by *Rhyzopertha dominica* (F). infestation. Seed germination decreased by about 34, 51 and 66% with 6, 7 and 8 wks of infestation, resp. Ethylene produced by growing seedling, the shoot length, and dry wt. of seedling grown from infested seeds decreased significantly with an increase in the duration of infestation. Ethylene produced by 4-day-old rice seedlings was highly correlated with shoot growth ( $r = 0.99$ ) and to a lesser extent with the dry wt. of seedling when 17 days old ( $r = 0.72$ ). The study revealed that ethylene produced during early shoot growth can be used for comparing insect infestation in rice seed stored under otherwise identical conditions. AS



- 781 Phillips (S), Mitfa (R) and Wallbridge (A). Rice yellowing during drying delays. *Journal of Stored Products Research* 25(3); 1989; 155-164

Yellowing of rice during drying delays was monitored in simulated experiments. Freshly harvested wet rough rice and paddy were compared with rice that has been harvested and dried rapidly. One set of 1 tonne heaps of rough rice and paddy, and sacks of rough rice were stored in a godown and another set exposed to the weather on a drying floor for days. Yellow grains (up to 100%) were found in the wet rough rice and paddy at high moisture (> 20% moisture content), associated with a high incidence of mould growth and heating of the grain, within 1 day heating of the heaps occurred, followed by visible mould growth after 2 days and yellowing of grains within 5 days. Rough rice that has been dried rapidly after harvest to 14% MC. produced less than 1% yellow grains. Observations on fungal growth were recorded and fungi were isolated from the rice. These were mainly *Humicola lanuginosa* (thermophile), *Aspergillus fumigatus*, *Aspergillus flavus*, *Aspergillus candidus* (thermotolerant sp.), *Corynaseus sepe-donium* (sp. of Mucorales) and *Pencillium* sp. (mesophilic). SGB

- 782 Proctor (A) and Palaniappan (S). Soy oil lutein adsorption by rice hull ash. *Journal of the American Oil Chemists' Society* 66(11); 1989; 1618-1621

Rice hull material was converted to an adsorbent of the soy oil pigment, lutein, by a combination of ashing and acid activation. Pigment was adsorbed from a 20% (v/v) soy oil/hexane miscella. The most effective ashing temp. was 500 C. Five per cent acid activation significantly promoted adsorption of the ash, but greater acid activation did not increase adsorption capacity very much. In the system studied, the performance of activated ash was comparable to that of activated bleaching earth. Nonactivated ash also had an ability to bind lutein but was less effective than activated adsorbent. The absorbance spectrum of the residual lutein was not altered by rice hull ash, but was changed when exposed to bleaching clay. AS

#### Rice bran

- 783 Takano (K). Studies on the mechanism of lipid-hydrolysing in rice bran. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 519-524 (Ja).
- 784 Takano (K), Kamoi (I) and Obara (T). Properties and degradation of rice bran spherosome. Studies on some mechanism of lipid-hydrolysing in rice bran. Part IV. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 468-474 (Ja).

This paper describes the properties and the degradation of spherosome in rice bran. The chemical components of rice bran spherosome were; diameters: 1-3  $\mu$ m; lipid content: 98.7 %, and protein content: 1.3%. The ratio of neutral lipids, glycolipids and phospholipids were 98.6:0.5:0.9. Triacylglycerol (TG), steryglyco-



side, and phosphatidylcholine were the major lipid components in the above neutral lipids, glycolipids and phospholipids, resp. When lipase, phospholipid acylhydrolase, phospholipase C and phospholipase D were added to rice bran spherosome, only phospholipase D degraded it through the enzymatic hydrolysis of phosphatidylcholine of the spherosome membrane to phosphatidic acid. It was concluded through this study that at the initial stage phospholipase D reacted with the phospholipid membrane of spherosome to damage its structure, which then allowed TG to get out through the spherosome membrane. After that lipase decomposed TG to free fatty acids. AS

#### Wheat

- 785 Al-kahtani (HA). Studies of Saudi Arabian locally produced wheat germ. Food Chemistry 34(2); 1989; 121-130

Local wheat germ (LWG) had higher protein and oil but lower crude fibre, total sugar, and carbohydrates than commercial wheat germ (CWG). Variation in amino acid comp. occurred in both samples. Lab. extracted commercial wheat germ oil (LECWGO) had the highest acid and peroxide values while commercial wheat germ oil (CWGO) was the lowest in unsaponifiable matter. Palmitic, stearic, oleic, linoleic and linolenic acid were found. Local wheat germ oil (LWGO) was the richest in alpha- and beta- tocopherols. Gamma- tocopherol was only found in CWGO. AS

- 786 Tuma (D), Sinha (RN), Muir (WE) and Abramson (D). Odour volatiles associated with microflora in damp ventilated and non-ventilated bin-stored bulk wheat. International Journal of Food Microbiology 8(2); 1989; 103-109

Western hard red spring wheat, stored at 20 and 25% moisture contents for 10 months during 1985-86 was monitored for biotic and abiotic variables in 10 unheated bins in Winnipeg, Manitoba. The major odour volatiles identified were 3-methyl-1-butanol, 3-octanone and 1-octen-3-ol. The production of these volatiles was associated and correlated with microfloral infection. Ventilation, used for cooling and drying of grain, disrupted microfloral growth patterns and production of volatiles. The highest levels of 3-methyl-1-butanol occurred in 25% moisture content wheat infected with bacteria, *Penicillium* spp. and *Fusarium* spp. In non-ventilated (control) bins with 20% moisture content wheat, 3-methyl-1-butanol was correlated with infection by members of the *Aspergillus glaucus* group and bacteria. In control bins, 1-octen-3-ol production was correlated with infection of wheat of both moisture contents by *Penicillium* spp. The fungal sp. isolated from damp bin-stored wheat and tested for production of odour volatiles on wheat substrate, included *Alternaria alternata* (Fr.) Keissler, *Aspergillus repens* (Corda) Saccardo, *A. flavus* Link ex Fries, *A. versicolor* (Vuill) Tiraboschi, *Penicillium chrysogenum* Thom, *P. cyclopium* Westling, *Fusarium moniliforme* Sheldon, *F. semitectum* (Cooke) Sacc. In the lab. fungus-inoculated wheat produced 3-methyl-1-butanol, 3-octanone and 1-octen-3-ol were also produced, but less frequently. Two unidentified bacterial sp. isolated from damp wheat and inoculated on agar produced



## 3-methyl-1-butanol. AS

## Wheat flour

- 787 Harland (BF) and Forlich (W). Effects of phytase from three yeasts on phytate reduction in Norwegian whole wheat flour. *Cereal Chemistry* 66(4); 1989; 357-358
- 788 Inakuma (T), Aibara (S) and Morita (Y). The role of glutenin and gliadin in physical dough properties of wheat flour. Comparison of farinograph properties of durum and bread wheat flours. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 437-447

The influence of added proteins (gliadin and glutenin) on the farinograph parameters of dough was investigated with three kinds of wheat flours (hard wheat flour, soft wheat flour and durum wheat flour). by the addition of gliadin, similar changes in the quality were observed for all three wheat flour; an increase in protein content was accompanied by an increase in the max. consistency concomitant with a decrease in the farinograph peak time and a marked decrease in the tolerance index. In the case of glutenin, on the other hand, the values of the tolerance index were reduced, and the farinograph peak time of durum wheat flour was extended by increasing protein content, although that of the other flours showed a similar tendency when gliadin was added. A synthetic flour dough consisting of starch and isolated gliadin or glutenin resulted in the poor quality doughs. Microscopic examination of the gluten matrix of the synthetic flour dough containing either gliadin or glutenin did not reveal the presence of an extended network structure observed in natural wheat flour doughs. The durum wheat flour dough had a relatively large network structure of gluten matrix, and was of low farinograph absorption. However, it required a long time to form the network structure, which was stable as compared with those of the bread wheat. It is also suggested that the quantity of immobilized water in the doughs is controlled by gliadin in the gluten matrix, although the capacity of the immobilized water essentially depends on the characteristics of glutenin. AS

## Wheat proteins

- 789 Orsi (F) and Pallagi (E). Relation of SDS soluble and insoluble wheat protein fractions to flour quality. *Nahrung* 33(3); 1989; 231-239 (De).

The quality of wheat to prepare bread and pastry products is determined in the first place by the quantity and quality of proteins. The proteins of 38 flour samples were extracted by 1.5% SDS and 5% beta-mercaptoethanol. The protein extracts were separated by HPLC on TSKG 3000 SW column and the proteins were measured at 280 nm by UV detector. The correlations between the macro quality characteristics (loaf vol. and valorigraph value) and the comp. of the protein fractions were investigated by multivariate statistical procedure. A good estimation of loaf vol. and valorigraph value was



possible from the quantity of fractions. AS

## MILLETS

### Corn

- 790 Weller (CL), Paulsen (MR) and Mbuvi (S). Germ weight, germ oil content, and estimated oil yield for wet milled yellow dent corn as affected by moisture content at harvest and temperature of drying air. Cereal Chemistry 66(4); 1989; 273-275

A split-plot experimental design was used to determine the effect of moisture content at harvest and temp. of drying air on wt. oil content, and estimated oil yield of corn germs recovered from lab. wet milling. The effects were determined for a high-yield hybrid of yellow dent corn widely grown in the corn belt that was hand-picked and hand-shelled. Germ oil content decreased significantly as moisture content at harvest and temp. of drying air increased. Germ wt. and estimated oil yield generally decreased as both moisture content at harvest and temp. of drying air increased from 17.2 to 29.6% and 22 to 93 C resp. A

### Sorghum

- 791 Lai (MN), Wang (HH) and Chang (FW). Thermal diffusivity of solid mash of sorghum brewing. A solid state fermentation. Biotechnology and Bioengineering 34(10); 1989; 1337-1340

Sorghum liquor brewing is a typical Chinese traditional process of solid-state fermentation. The value of thermal diffusivity of sorghum mashes during fermentation is needed to predict the value of thermal conductivity to provide pertinent data for the design of bioreactors. This study indicated that the change of thermal diffusivity of sorghum mashes is not sensitive to the fermentation time. GAR

- 792 Phillips (RD) and Falcone (RG). Extrusion of sorghum and sorghum-peanut mixtures. Effect of barrel temperature and feed moisture on physical-textural characteristics. Journal of Texture Studies 19(2); 1989; 185-197

Sorghum and 85% sorghum-15% full-fat peanut meals were extruded over a range of barrel temp. (160-205 C) and feed moistures (13-25%) in a pilot-scale machine. The resulting products were characterized for physical and textural properties. Resulting data were fit to third order models and the corresponding response surfaces plotted. For both comp., max. expansion and min. density and textural strength occurred at low-to-medium temp. and moisture. Some extrudates compared favourably with commercial snack products. The addition of full-fat peanut to sorghum meal enhanced the expansion and tenderness in the optimum range. A 70% sorghum - 30% full fat peanut mixture could not be extruded successfully. AS



- 793 Yousef (AMM), Moharram (YG), Moustafa (EK) and Bolling (H). Tannin and non-tannin polyphenolic compounds of the Egyptian sorghum grains. *Nahrung* 33(3); 1989; 269-274

The fractionation and properties of the polyphenolic compounds of the Egyptian sorghum grains were studied. The results showed that sorghum grains contained a higher amount of non-tannin polyphenols than tannin ones. By utilizing the funnel separation technique higher recovery for both tannin and non-tannin polyphenol fractions was given compared with the Sephadex L H 20 column chromatography method. The refractation of both fractions using TLC technique showed that each fraction of tannin and non-tannin composed of different compounds differed in their properties. AS

#### PULSES

- 794 Chang (KC), Chang (DC) and Phatak (L). Effect of germination on oligosaccharides and non-starch polysaccharides in navy and pinto beans. *Journal of Food Science* 54(6); 1989; 1615-1619

Effect of germination on raffinose-oligosaccharides, and non-starch polysaccharides in C-20 navy and Pindak pinto beans was investigated using solvent fractionation and chromatographic methods. Approx. 70-80% of total raffinose and stachyose was removed by germination for 6 days. Ungerminated navy and pinto beans contained 21.75% and 18.84% total non-starch polysaccharides, resp. Germination did not significantly change in yields of soluble and insoluble non-starch polysaccharides. Arabinose in the soluble non-starch polysaccharides was significantly increased by germination. Germination increased the viscosity of soluble non-starch polysaccharides. However, the viscosity of soluble non-starch polysaccharides from germinated pinto beans was significantly greater than that from germinated navy beans. AS

#### African locust beans

- 795 Ikenebomeh (MJ). The influence of salt and temperature on the natural fermentation of African locust bean. *International Journal of Food Microbiology* 8(2); 1989; 133-139

Variations in salt (NaCl) content and temp. influenced the microbial development and organoleptic quality of fermenting African locust bean (*Parkia filicoidea* Welw.) seeds. The influences on microbial growth by different salt contents and temp. were followed by changes of pH and titratable acidity. A 1% (w/w) salt addition and fermentation at 37 °C improved the organoleptic quality of the product. Salt additions above 3% (w/w) and temp. below 25 °C resulted in lower microbial counts, low pH and titratable acid values; fermentation of the processed substrate of African locust bean seeds was inhibited and the organoleptic quality was poor. The predominant microorganisms present throughout the fermentation was a *Bacillus* sp. with characteristics similar to *Bacillus subtilis*. AS



## Butter beans

- 796 Lopez (A) and Williams (HL). Essential elements in dry and canned butter beans (*Phaseolus limensis* L.). *Journal of Food Protection* 52(3); 1989; 204-206

Ten essential elements were determined in dry and canned butter beans (*Phaseolus limensis* L) by atomic absorption spectrophotometry. Samples were taken at different stages during the canning process to determine where changes in element content occurred. The content of each samples was compared statistically to other samples taken within the process. Element retention, excluding chloride and sodium, ranged from 51 to 84% on a dry wt. basis, and 14 to 24% on wet wt. basis. AS

## Cowpeas

- 797 Don-Pedro (KN). Effects of fixed vegetable oils on oviposition and adult mortality of *Callosobrochus maculatus* (F.) on cowpea. *International Pest Control* 31(2); 1989; 34-37

The mechanisms of action of fixed vegetable oils in reducing progeny development of *Callosobrochus maculatus* on cowpea were investigated. When all cowpea grains were treated with groundnut and traditional coconut oils, oviposition by mated females was not affected although there was significant subsequent egg mortality. However, in a two-way choice exp., *C. maculatus* showed a strong oviposition preference for grains not treated with oils. In general, fixed vegetable oils applied at rates of up to 14 ml/kg substrate were shown to have no direct toxicity against adults of *C. maculatus*, thus explaining normal oviposition in no-choice situation. It was concluded that the main toxic action of fixed vegetable oils was against eggs and that a uniform spread of oils on all grains would be necessary to maximise effectiveness. AS

- 798 Fashakin (JB) and Ojo (FA). Chemical composition and nutritive changes of some improved varieties of cowpea (*Vigna unguiculata*) (L. walp). 2. New breeds of varieties from the international institute for tropical agriculture, Ibadan, Nigeria. *Tropical Science* 28(3); 1988; 191-199

Following the work described in part 1. 10 new var. of cowpea (*Vigna unguiculata*) were assessed in terms of chem. comp. and other proximate analysis. Physical and organoleptic properties were also assessed. The results indicated that the new var. contained high levels of Fe, Ca, Cu, and proteins, in conformation of previous reports. The protein content ranged from 20.9% to 26.9% and Fe content ranged between 16.02 and 22.51 mg/100 g. Although the levels of Ca were relatively high, with a range of 16 to 24 mg/100g, dietary supply of this nutrient could be hampered by the limited availability of Ca in legumes. On the whole, taste panel acceptability did not reflect chem. comp. as much as physical properties relating to colour, texture and soaking time. It was concluded that some of the var. under investigation were quite suitable for use in the develop-



ing countries in terms of nutritional adequacy and consumer acceptability. AS

- 799 Ningsanond (S) and Ooraikul (B). Dry and wet milling of red cowpea. Canadian Institute of Food Science and Technology Journal 22(1); 1989; 25-33

Red cowpea flours, starch and protein were prepared using dry and wet processing methods. At optimum conditions, dry dehulling with an abrasive dehuller gave 75% yield of dehulled seeds with 30% hull remaining and 18% cotyledon loss compared with 70% yield, 2% hull remaining and 20% cotyledon loss from wet dehulling of soaked seed (8-10 h at 30 C) using a stone mill with 3.5 mm clearance. There was little difference in chem. comp. between flour made from either dry or wet dehulled seeds. Double air classification of dry-dehulled flour produced starch and protein fractions with separation efficiencies of 94.0 and 72.6%, resp. This resulted in 61.5% yield with 94.0% recovery for starch and 38.5% yield with 72.6% recovery for protein. Fat, minerals, dietary fiber, sugars and damaged starch were air classified along with the protein fraction. Wet processing of whole seeds produced starch with an average yield of 34.1% with 75.4 recovery and protein isolate with an average yield of 19.4% with 63.8% recovery. No damaged starch was found in starch isolated by wet process. AS

#### Green beans

- 800 Aparicio-Cuesta (P), Rivas-Gonzalo (JC), Santos-Buelga (C) and Garcia-Moreno (C). Quality of frozen green beans (*Phaseolus vulgaris*) subjected to different storage conditions. Journal of the Science of Food and Agriculture 48(2); 1989; 249-259

This work describes the changes in the vitamin C chlorophylls and carotenoids and the sensory characteristics of the frozen green beans (*Phaseolus vulgaris*) subjected to different storage conditions. Frozen green beans were stored at -22 C and under satisfactory conditions with temp. fluctuations and at room temp. It was seen that during storage at -22 C 68% decrease occurred in vitamin C after 30 months. The pigments also decreased but the time course is irregular and its sensory quality remained acceptable for at least 15 months at -22 C. Under unsatisfactory conditions the content of the compounds decreased resulting in deterioration of sensory quality. Under fluctuating temp. deterioration is most evident as a decrease in flavour characteristics and increases in the loss of outer cuticle of the beans when boiled. NGKR

#### Mung beans

- 801 Sattar (A), Durrani (SK), Mahmood (F), Ahmad (A) and Khan (I). Effect of soaking and germination temperatures on selected nutrient and antinutrients of mungbean. Food Chemistry 34(2); 1989; 111-120

Effects of different temp. during soaking and germination on selected nutrients and antinutrients of mungbean, were studied. Com-



parison of the coeff. of variability revealed striking differences in their values as a result of soaking and germination. Soaking at 55 C resulted in larger decreases in the phytate and trypsin inhibitor activity than at 27 C whereas protein was little affected. Biosynthesis of protein, ascorbic acid and riboflavin protein was generally greater, and biodegradation of phytate and trypsin inhibitor higher, during germination at ambient conditions (20-35 C) than at low temp. (20 C) while thiamine and amino acid contents were less affected. Max. contents of ascorbic acid (47.0 mg/100g), riboflavin (3.54 µg/g) and thiamine (4.37 µg/g) were detected during germination for 48-72 h irrespective of temp. A slight increasing trend in the protein content (18.4-23.5%) but decreasing trends in the phytate (216-105 mg/100 g) and trypsin inhibitor (2460-497 TIU/g) values, were observed during germination regardless of the temp. tested. AS

### Peas

#### Pea starch

- 802 Haase (NU) and Kempf (W). Notes on the quality of pea starch. Starch/Starke 41(2); 1989; 49-54 (De).

Starch from 4 var. each of two subsp. viz sativum (smooth) and Medullane (wrinkled), pea (*Pisum sativum*) have been studied. Smooth peas contained 50% starch (dry basis) whereas it was about 30% (db) in wrinkled peas. Smooth pea starch contained 50% granules of smaller size (dia < 20 µm) as compared to wrinkled pea starch which had 100% small granules. The swelling power of smooth pea starch was higher than that of wrinkled pea, but their solubilities were not significantly different. SZA

#### Winged beans

- 803 Bello (AB) and Okezie (BO). Effect of extraction conditions on the extractability of winged bean (*Psophocarpus tetragonolobus* (L) DC) proteins. Journal of Food Science 54(6); 1989; 1656-1657

Protein extractability from defatted winged bean flour was studied under various conditions of pH (2, 4, 6, 8, 10, 12) temp. (15, 30, and 45 C) and time (10, 20, 30 min). Results indicated that protein extractability was strongly pH dependent. Max. protein extractability was attained at pH 12 while the min. extractability occurred at pH 4. Protein extractability was not significantly affected at the various temp. and time combinations; however, when extraction time was extended (at 15 min increments) from 30 min to 120 min. Significantly higher (15%) protein was extracted at 30 C after an additional 60 min. Increased solvent-to-flour ratios resulted in increased protein extractability, but increased salt (NaCl and CaCl) concn. (IM) decreased extractability. AS



## OILSEEDS AND NUTS

## Almonds

- 804 Schirra (M) and Agabbio (M). Influence of irrigation on keeping quality of almond kernels. *Journal of Food Science* 54(6); 1989; 1642-1645

Quality and chem. changes were determined in almond kernels (*Prunus amygdalus*) stored for 12 months under simulated warehouse conditions after being harvested from irrigated and non-irrigated trees. The chem. and physical characteristics of the extracted oil differed greatly among the 6 cvs tested. Irrigation and storage significantly influenced quality of the kernels and stability of the oil. Autooxidation during storage was closely correlated with the degree of unsaturation in the oil extracted at harvest time. Free fatty acid content, saponification values and spectrophotometric indices of the oil after 12 months' storage revealed greater oxidative alterations in the kernels from irrigated plots than in non-irrigated ones. AS

## Cashewnuts

- 805 Muturi (P) and Arunga (RO). Cashewnut shell liquid. A review of production and research in Kenya. *Tropical Science* 28(3); 1988; 201-218

The cashew tree (*Anacardium occidentale* L.) has been grown in Kenya, mainly as a source of cashewnuts. One of its by-products, with considerable potential in industrial processing, is cashewnut shell liquid (CNSL). However there has not been significant production of this, either for local or export markets. Full advantage has not, therefore, been taken of the crop. Only a small fraction of the cashewnut shell liquid is extracted during the roasting of the nut. Subsequently the shell is thrown away as waste. This paper presents a historical review of the cashewnut industry, with emphasis on the potential production of cashewnut shell liquid in Kenya and reports briefly on a few experimental studies aimed at developing secondary commercial products from CNSL. Various methods of extracting the liquid from the shell are reported, and formulations for coating materials based on CNSL are described. Physical and performance characteristics similar to those of existing commercial products can be achieved. AS

## Groundnuts

- 806 Hao (DY-Y) and Brackett (RE). Growth and survival of *Flavobacterium aurantiacum* in peanut milk. *Journal of Food Protection* 52(3); 1989; 165-168

Tryptone-yeast extract-glucose (TYG) and trypticase soy broth (TSB) were evaluated for production and recovery of *Flavobacterium aurantiacum* stationary phase cells. In addition, growth of *F. aurantiacum* in peanut milk was tested. Trypticase soy broth was chosen as



the best medium for producing stationary phase cells. Both non-defatted peanut milk (NDPM) and partially defatted peanut milk (PDPM) supported growth of *F. aurantiacum*. The growth of *F. aurantiacum* in both kinds of peanut milk was not inhibited by aflatoxin B<sub>1</sub> (1 mg/ml). About  $10^4$  stationary phase cells were inoculated in 0.067 M phosphate buffer (PB) at pH 5.0, 5.5, 6.0, 6.5, and 7.0 and in both peanut milks (pH 6.3 and 6.9). After a 24 h incubation period, the viable cell number decreased slightly in PB (pH 7.0 30 °C), but decreased 2-3 logs in other buffers. About 0.6-0.8 log decrease was observed in NDPM and PDPM. Phosphate buffer (0.067 M, pH 7.0), NDPM and PDPM were determined to be adequate for use in studies to investigate the removal of aflatoxin B<sub>1</sub> by *F. aurantiacum*. AS

- 807 Moss (JR) and Otten (L). A relationship between colour development and moisture content during roasting of peanuts. Canadian Institute of Food Science and Technology Journal 22(1); 1989; 34-39

The colour data showed that the major changes in colour development occurred after about 6 to 8 min. of roasting. At this time the values of the a and b colour scales increased rapidly, while those of the L scale decreased. The results of the study appear to indicate that the development of both L and a colours- which represent the degree of lightness and the red-green range, resp. depends on the characteristics of the unroasted nuts. In particular, it is suspected that the maturity of the nut is important in determining the L and a values. The results also showed that the b colour which represents the yellow-blue range was not affected by the source of the samples. Therefore, the data of both Test Sets could be combined and correlated with the moisture content for a roasting temp. range of 157 to 171 °C. AS

- 808 Rubico (SM), Phillips (RD), Resurreccion (AVA) and Beuchat (LR). Nutritional, microbiological, and sensory qualities of a peanut beverages prepared using various processes. Journal of Food Science 54(6); 1989; 1540-1543

Nutritional, microbiological and sensory qualities of peanut beverages processed at 85 , 100 and 121 °C for 15 min and 121 for 3 min were determined. Heating improved the digestibility of peanut beverages, particularly those processed at 121 °C for 3 sec and 85 °C for 15 min. Methionine was particularly sensitive to the treatment at 121 °C. The limiting amino acids were threonine, cystine, valine, lysine and tryosine. No microbial growth was observed in products processed at 100 °C and 121 °C followed by storage at 4 °C and 30 °C for 20 days. Beverage processed at 85 °C and 30 °C for 3 days contained an aerobic microbial population of  $2.4 \times 10^4$  CFU/mL. The beany flavour was least pronounced in beverages processed at 100 °C for 15 min and strongest at 121 °C for 3 sec. AS

#### Soybeans

- 809 Ali Asbi B, Wei (LS) and Steinberg (MP). Effect of pH on the kinetics of soybean lipoxygenase-1. Journal of Food Science 54(6); 1989; 1594-1595, 1600



The influence of pH on the kinetics of soybean lipoxygenase-1 was examined. Lipoxygenase-1 was stable when preincubated in the pH range for 3.2 to 9.2 but was irreversibly denatured at pH 3.0 and below. Double reciprocal plots for undenatured enzyme in the pH range 5.6 to 9.2 showed that the enzyme obeyed Michaelis-Menten kinetics in this pH range. The Dixon plot ( $\log v_{max} K_m$  vs pH) indicated an active site of the free enzyme to be a histidine residue with a pK of about 7.3. AS

- 810 Matoba (T), Sakurai (A), Taninoki (N), Saitoh (T), Kariya (F), Kuwahata (M), Yukawa (N), Fujino (S) and Hasegawa (K). n-Hexanol formation from n-hexanal by enzyme action in soybean extracts. Journal of Food Science 54(6); 1989; 1607-1610

n-Hexanal in soybean homogenates decreased during incubation at alkaline pH. When soybean extracts were dialyzed and then incubated with n-hexanal and cofactors [nicotinamide adenine dinucleotide (NAD<sup>+</sup>), the reduced form (NADH), nicotinamide adenine dinucleotide phosphate (NADP<sup>+</sup>), and the reduced form (NADPH)], NADH and NADPH stimulated the enzymatic reduction of n-hexanal with NADH being more effective than NADPH. When undialyzed preparations were incubated, all the cofactors stimulated enzymatic activity, with NADH being the most effective. The reaction product in all the incubation mixtures was n-hexanol; n-hexanal was reduced to n-hexanol stoichiometrically. It was suggested that alcohol dehydrogenase was responsible for the decrease of n-hexanal in soybean homogenate at alkaline pH. AS

- 811 Petres (J) and Czukor (B). Investigation of the effects of extrusion cooking on antinutritional factors in soybeans employing response surface analysis Part 1. Effect of extrusion cooking on trypsin-inhibitor activity. Nahrung 33(3); 1989; 275-281

A Brabender 20 DN lab. scale extruder was used to study the effect of processing parameters on trypsin-inhibitor activity in dehulled soybeans employing response surface analysis. Process variables examined were: Temp. of die (150, 160 and 170 °C), feed moisture content (12, 16 and 20 %C) and screw speed (80, 120 and 160 rpm). Trypsin-inhibitor activity of extruded products was measured. The correlation with a multiple detn. coeff. ( $R^2 = 0.976$ ) and the mathematical model developed in this study were found to be significant. AS

- 812 Yoshida (H) and Kajimoto (G). Effects of microwave energy on the tocopherols of soybean seeds. Journal of Food Science 54(6); 1989; 1596-1600

The effects of microwave heating on the tocopherols of soybeans were studied in relation to chem. changes in the lipids. The amounts of alpha-, beta-, gamma- and delta- tocopherols in the soybeans before microwave treatment ranged from 6.2 to 13.0, 2.7 to 4.5, 60.0 to 76.8 and 45.7 to 57.9 mg/100 g lipid, resp. gamma- and delta-tocopherol concn., gradually decreased, and as much as 40% of the tocopherols originally present in the soybeans was lost after 12 min



heating. However, microwave treatment of soybean of 6 min, which would be optimal to prepare full-fat soy flour without a burnt odour, retained ca. 90% of the individual tocopherols with a few exceptions and caused no significant difference in the chem. changes of the lipids. AS

#### Soy products

#### Soy curd

- 813 Gandhi (AP) and Bourne (MC). Effect of pressure and storage time on texture profile parameters of soybean curd (Tofu). *Journal of Texture Studies* 19(2); 1988; 137-142

The pressure applied to soybean curd during processing into tofu has a profound effect on the moisture content, yield and some textural parameters of tofu. As the pressure increased from 0.186 P to 0.744 P the moisture content decreased from 82% to 60% and yield decreased from 2.0 kg to 1.2 kg per kg whole dry soybeans. Hardness-1, hardness-2, chewiness and gumminess increased linearly with increasing pressure. Springiness, cohesiveness, adhesiveness and stringiness were hardly affected by increasing pressure. During storage in water at 2 - 3 C for 3 wks, hardness, gumminess, and adhesiveness increased moderately; springiness decreased moderately and the other texture parameters were almost unchanged. AS

#### Soy milk

- 814 Murata (K), Kobayashi (H), Kusakabe (I), Teramoto (H) and Murakami (K). Preparation of fermented soy milk curd with commercial proteinases. *Journal of the Japanese Society of Food and Nutrition* '(Eiyo to Shokuryo') 36(5); 1989; 417-423

Soy milk curd was prepared by using three kind of proteinases having soy milk-clotting activity (subtilisin, thermolysin and bromelain) as a coagulant followed by lactic acid fermentation. Among these fermented soy milk curds, the curd made with thermolysin showed a little high moisture content than the other. On the other hand, the curd made with bromelain had a little higher protein recovery and yield than the others. In order to estimate the extent of proteolysis in fermented soy milk curd, analyses were made on electrophoretic patterns, the ratio of water soluble nitrogen to total nitrogen, and free amino acid content. The results of these exp. showed that thermolysin and subtilisin hydrolyzed the protein in fermented soy milk curd more than bromelain did. None of the soy milk curd which was fermented for 2 wks developed bitterness or rancidity. The fermented soy milk curd made with thermolysin was slightly superior in texture (smoothness) to that made with the others. The results of this study suggest that thermolysin, as compared with subtilisin and bromelain, is more suitable for making fermented soy milk curd with respect to proteolysis and texture (smoothness). AS



## Soy proteins

- 815 Chung (S) and Villota (R). Binding of alcohols by soy protein in aqueous solutions. *Journal of Food Science* 54(6); 1989; 1604-1606

Interactions of alcohols with soy protein isolate were investigated using an equilibrium dialysis method. It was found that interactions may involve hydrophobic association and to some degree, hydrogen bonding. Studies with soy protein with various levels of denaturation indicated that denaturation of the protein by heating may limit its ability for the formation of hydrogen bonds with alcohols. The proteins under investigation exhibited practically unlimited binding capacity for alcohols. AS

## TUBERS AND VEGETABLES

## Root vegetables

## Cassava

- 816 Adisa (VA). Amylase activities and cyanide tolerance of five cassava tuber spoilage molds. *Nahrung* 33(3); 1989; 297-302

Studies on the amylase activities and tolerance to cyanide by five spoilage molds of cassava tuber were carried out. None of the test fungi grew in 0.1 g/ml concn. of potassium cyanide while only *Aspergillus aculeatus* and *A. niger* grew in 0.05 g/ml. Except for *B. theobromae*, all the other four molds synthesised amylases on the 2nd day of incubation. Highest amylase activities by the molds were recorded between pH 6-7 and at 25 C. The molds degraded satisfactorily the raw starch and protein contents of the blended cassava tuber pulp. Total reducing sugars were detected in large quantities from the mold deteriorated cassava tuber. AS

- 817 Lopez-Ulibarri (R), Huerta (S), Schettino-Bermudez (B) and Gutierrez-Rojas (M). Gelatinization of cassava meal for solid state fermentation. *Journal of Food Engineering* 9(3); 1989; 237-243

Solid substrate fermentation (SSF) of cassava meal for protein enrichment with *Aspergillus niger* requires pregelatinization to facilitate its microbial assimilation. Studies on a lab. scale (50-100 g) showed that the product has a suitable texture of SSF when cassava meal had been heated indirectly and 5% (v/w) of edible vegetable oil was added. In this work, a conventional mixer was modified for use as a gelatinization reactor (10-15 kg of dry material). This mixer has a built-in horizontal stirrer and a jacket heated with saturated steam. It was found that with a residence time of 20-25 min, a temp. of 96 C and a stirrer speed of 12.8 r.p.m. the degree of gelatinization reached in the lab. trials could be reproduced and,



subsequently, a max. protein increase by SSF of 9.5% with *A. niger* could be achieved. AS

#### Cassava starch

- 818 Ghildayal (NP), Ramakrishna (M) and Lonsane (BK). Comparative economics of the production of high fructose syrup from cassava chips and cassava starch. *Starch/Starke* 41(2); 1989; 64-68

Although high fructose syrup (HFS) conforming to standards is obtained from cassava chips converted to flour the comparative economics showed that the gain of lower expenses on raw material by use of chips instead of starch are completely upset by the higher capital investment as plant and machineries as well as higher expenses on activated carbon and steam. The use of cassava flour also imposed many limitations and problems upon the process operation. The direct utilization of cassava chips, as compared to starch, is therefore not commercially viable for the production of HFS. SZA

- 819 Osunsami (AT), Akingbala (JO) and Oguntemein (GB). Effect of storage on starch content and modification of cassava starch. *Starch/Starke* 41(2); 1989; 54-57

Yield of starch from fresh roots (24.4%) was significantly greater than the yield (16.7%) from roots stored at room temp. for 6 days. The isolated starch was treated with different concn. of hydrochloric acid to produce thin boiling and dextrinized starch, and different concn. of acetic anhydride to produce acetylated starch. The alkali number of thin-boiling and dextrinized starches increased with acid treatment while viscosity decreased. The degree of substitution, in case of acetylated starch, increased with concn. of acetic anhydride. The cold water solubility of acid thinned and acetylated starches was similar to that of native starch while it increased for dextrinized starches with acid concn. The viscosity of acetylated starches increased with degree of substitution. SZA

#### Vegetables

- 820 Fleschi (M), Codignola (A) and Luppi Mosca (AM). Mutagenic flavonol aglycones in infusions and in fresh and pickled vegetables. *Journal of Food Science* 54(6); 1989; 1492-1495

Free flavonol aglycones, potentially mutagenic, were determined in vegetable infusions, in fresh and pickled vegetables and in vegetables exposed to mold growth. None of the infusions tested contained any considerable amount of free mutagenic aglycones, but some vegetables, such as red onions and cucumbers, and appreciable amounts of free flavonol aglycones, especially in the external layers. The treatment used in the production of pickled vegetables did not change the quality and quantity of the flavonols but the presence of molds altered the quantity of flavonol aglycones and glycosides. AS

## Leafy vegetables

## Cabbages

- 821 Onoda (A), Koizumi (T), Yamamoto (K), Furuya (T), Yamakawa (H) and Ogawa (K). A study on variable low pressure storage for cabbage and turnip. Journal of the Japanese Society of Starch Science '(Denpun Kogyo Gakkaishi)' 36(5); 1989; 369-374 (Ja).

The variable low pressure storage (VLPS) that regulates the different pressures  $P_1$  and  $P_2$  during storage in a chamber possesses advantages on the supply of oxygen gas into the chamber and the exclusion of carbon dioxide gas from it because of changing inner pressures periodically storage tests were done in order to compare VLPS with ordinary low pressure storage, using cabbage and turnip. The pressure  $P_1$  was set up the 100 mmHg, and the other Pressure  $P_2$  was set up the 300 mmHg at these tests. VLPS was superior to the ordinary low pressure storage in the ratio of wt. loss or the appearance of both cabbage and turnip. The VLPS system did not require a moisture implement because the inlet air to the chamber was saturated instantly with water vapour which was produced by respiration or evaporation from cabbage or turnip. AS

## Melons

## Cucumbers

- 822 Kuo (S-H) and Parkin (KL). Chilling injury in cucumbers (*Cucumis sativa* L.) associated with lipid peroxidation as measured by ethane evolution. Journal of Food Science 54(6); 1989; 1488-1491

The development of chilling injury in cucumbers stored at 4 °C and 95% RH was evaluated. Irreversible damage due to chilling required 7 to 10 days as indicated by increases in tissue electrolyte leakage (from 30 to 70%), stress ethylene production (to 30-60  $\mu\text{mol g}^{-1} \text{hr}^{-1}$ ) and visual manifestations of injury. Low levels of ethane evolution ( $< 1 \mu\text{mol g}^{-1} / \text{hr}^{-1}$ ) were observed for unchilled and continuously chilled fruits. Upon rewarming, ethane evolution was stimulated by an order of magnitude following a prior chilling exposure of at least 7 days. These results indicate that the potentiation of lipid peroxidation in chilled cucumbers is associated with the onset of irreversible injury. AS

## Tomatoes

- 823 Cameron (AC), Boylan-Pett (W) and Lee (J). Design of modified atmosphere packaging systems. Modeling oxygen concentration within sealed packages of tomato fruits. Journal of Food Science 54(6); 1989; 1413-1416, 1421

A method was developed for detn. of oxygen consumption as a function of oxygen concn. by mathematical characterization of oxygen depletion by a tomato fruit in a closed system with time. Mathemati-



cal equations were developed describing oxygen consumption as a function of oxygen concn. for breaker, pink and red tomato fruit and were used to model film permeability characteristics (oxygen permeability coeff. surface area, thickness) as a function of fruit wt. to achieve desired sealed package concn. of oxygen in modified atm. packages. Equations were also developed to describe the time for initial oxygen establishment as affected by void vol. Calculations are presented for optimizing package parameters for tomato fruit. AS

- 824 Upasana Rani and Bains (GS). Physico-chemical and pectic changes in ripening tomato cultivars. *Tropical Science* 28(3); 1988; 185-189

Composition and pectolytic changes in two tomato cvs., 'Pb. Chhuhara' and 'Pb. Kesri', at the green intermediate and red-ripe stages were investigated. Lycopene content of the ripened tomato showed a spectacular increase. The oval shaped Pb. Chhuhara' tomato contained a higher percentage of alcohol-insoluble solids than the roundish 'Pb. Kesri' tomato. Water soluble pectin predominated in both the cvs. but 'Pb. Chhuhara' exceeded substantially that of 'Pb. Kesri'. 'Pb. Chhuhara' was judged to be the commercially superior var. AS

## FRUITS

- 825 Gemma (H), Oogaki (C), Fukushima (M), Yamada (T) and Nose (Y). Preservation of some tropical fruits with an apparatus low pressure storage for practical use. Effect of low pressure storage on fruits and vegetables. Part I. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 508-518

Effect of low pressure was investigated on the preservation of avocado and papaya fruits with a view of applying this technique to the storage of fruits by using a practical apparatus. Effects of a low partial pressure of oxygen at a low temp. were clearly demonstrated on the retardation of ripening, prevention of deterioration and decay compared with normal pressure storage at a low temp. The maturity of papaya fruit stored at a low pressure and low temp. was delayed for 3 wks compared with the fruits kept at a normal pressure and low temp. during 40 days storage, when the fruits used were immature at the time of harvest or prior to transportation. The firmness and the peel colouration of the papaya fruits could be kept in better condition during 40 days storage period by treatment with hot water dips, than those of the fruits not subjected to hot water dips. AS

## Apples

- 826 Bains (MS), Ramaswamy (HS) and Lo (KV). Tray drying of apple puree. *Journal of Food Engineering* 9(3); 1989; 195-201

This study was undertaken to investigate the influence of different factors on the drying rate of apple puree in a cabinet air

drier and to suggest optimum operating conditions for obtaining a good quality fruit leather. In this connection the drying of apple puree in a forced air circulation cabinet drier with a cross flow tray arrangement was evaluated using a 3 x 2 factorial design of exp. involving air temp. (70 C and 94 C) flow rate (2.0 and 4.1 m/s) and R.H. (5 and 15%) as main factors. With the help of drying curves the influence of these factors on the rate of moisture removal was studied as well as to predict the time required to dry the product to a final moisture content of 20% (dry basis). The results revealed that a two stage drying operation involving a high temp., low humidity and high flow rate combination in the first stage followed by a lower temp. finish drying was found to yield a better product. NGKR

- 827 Bin (F) and McLellan (MR). Effect of sample weight and orientation on the texture press force of apple slices. *Journal of Texture Studies* 19(2); 1988; 153-160

Texture measurements of both fresh apple slices and steam-blached apple slices were studied using the FTC texture press. Sample wt. of 40, 70, 100, 130, and 160 g slices were tested and three orientations (crosswise, lengthwise and randomly) of slices in the standard shear compression cell. The max. shearing force approaches a constant when the sample wt. reaches 70 g for blached slices. Sample wt. of 100 g for fresh slices and 100-130 g for blached slices are suggested by these test results. Crosswise or random orientation of slices in the cell is preferred. Polynominal models of the max. force (N) versus sample wt. (g) are given and shown to be a closer fit over simple linear models. AS

#### Citrus fruits

- 828 Faid (M) and Tantaoui-Elaraki (A). Production of toxic metabolites by *Penicillium italicum* and *P. digitatum* isolated from citrus fruits. *Journal of Food Protection* 52(3); 1989; 194-197

Ninety-six mold isolates were obtained from naturally rotten citrus fruits. Among them, forty were identified as *Penicillium italicum* and twenty-four as *P. digitatum*. Twenty-four isolates of the former and twenty of the latter were tested for toxigenesis. They were first grown on Yeast Extract Sucrose (YES) broth for ten d at 22 C. Then, after mycelium removal, the cultures were sterilized by Millipore filtration and the toxicity of the sterile filtrates tested by four different bioassays; i.e. a bacterial test with *Bacillus megaterium*, a plant test with *Lepidium sativum* a test with the brine shrimp *Artemia salina* and the chick (*Gallus domesticus*) embryo test. In *P. digitatum*, 95% of the filtrates were toxic by *B. megaterium*, 100% caused strong inhibition of seed germination in *L. sativum*. 75% showed acute toxicity to the brine shrimp and 65% were toxic to the chick embryo, while the figures for *P. italicum* results observed with the four different tests didn't always correlate. AS

- 829 Kawamura (Y), Uchiyama (S) and Saito (Y). Improvement of the half-embryo test for detection of gamma irradiated grapefruit and its application to irradiated oranges and lemons. *Journal of Food Science*



54(6); 1989; 1501-1504

The duration of the half-embryo test used for identification of gamma irradiated grapefruit was shortened by increasing germination temp. to 35 C. Max. shooting percentages were reached within 3 days. Gibberellin application reduced the required incubation time to 2 days. Half-embryos extracted from irradiated orange and lemon gave similar results to those of grapefruit. This half-embryo test is proposed as an identification method from irradiated citrus. Assessment can be made after 3 to 4 days when shooting percentage is greater than 50%. AS

#### Grapes

- 830 Gonzalez-Lara (R), Correa (I), Polo (MC), Martin-Alvarez (PJ) and Ramos (M). Classification of variety musts by statistical analysis of their electrophoretic protein pattern. Food Chemistry 34(2); 1989; 103-110

Unsupervised classification techniques (Principal Components Analysis and Cluster Analysis) have been applied to electrophoretic analytical data from seventeen grape must samples of six different cvs. A good grouping of samples according to their cultivar has been obtained. AS

#### Melons

- 831 Teotia (MS) and Ramakrishna (P). Densities of melon seeds, kernels and hulls. Journal of Food Engineering 9(3); 1989; 231-236

In this investigation a suitable water separation tank which can be used either for batch or continuous purpose based on the density has been designed for separation of kernel and seed fractions obtained by mechanical dehulling, of the melon seeds. For this purpose true density, bulk density and apparent density of the seeds, kernels and hulls of commercial var. of muskmelon, long melon and water melon were determined and it was shown that there is a significant difference between the apparent densities of kernels and seeds. Kernels were denser than water whereas seeds were less dense there by kernels sink while seeds float in water. Based on this principle the above device was developed. NGKR

#### Prince melon

- 832 Sugiyama (J), Hayashi (T) and Horiuchi (H). Changes in electrical impedance of prince melon during ripening. Journal of the Japanese Society of Food and Nutrition '(Eiyo to Shokuryo)' 36(5); 1989; 424-427

Electrical impedance of prince melons was studied for application to quality evaluation. The electrical information at only 1 cm depth from the surface of samples showed remarkable changes with ripening. Moderate correlations between some impedance parameters and maturity index were observed from the results of measurements.

It was speculated that the correlations reflected the changes in cell membrane and cell wall. However better correlation with maturity is needed to establish an impedance method for quality evaluation. AS

#### Oranges

- 833 Sugisawa (H), Yamamoto (M), Tamura (H) and Takagi (N). The comparison of volatile components in peel oil from four species of Navel orange. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 455-462 (Ja).

The comparison of volatile components in the peel oil of Navel orange was carried out to elucidate the differences of aroma quality between closely related sp. The essential oils were prepared by simultaneous distillation-extraction, from four sp. of Navels such as Washington (*Citrus sinensis* Osbeck Washington), Hukumotobeni (*C. sinensis* Osbeck cv. Hukumotobeni), Ohmishima (*C. sinensis* Osbeck cv. Ohmishima), Shiroyanagi (*C. sinensis* Osbeck cv. Shiroyanagi), which were harvested in Shikoku, Japan. Each oil was separated into hydrocarbon and oxygenated compounds fractions through a silica gel column, and analyzed by a combined capillary gas chromatography-mass spectrometer (GC/MS). Twelve components in the hydrocarbon fraction of each peel oil were identified by GC/MS and Kovats Indices. Moreover, 68 components in Washington navel, 62 components in Hukumotobeni, 58 components in Ohmishima, 65 components in Shiroyanagi were identified as the oxygenated compounds. As these oxygenated fractions had the characteristic aroma of the peel oil, they were further separated into four fractions, and then examined by GC/MS and GC-sniffing. The character impact compound of navel orange aroma was not found, but it was suggested that floral, herbaceous and fruity components were important to Navel orange aroma and their interaction affected mainly to the characteristic aroma of Navel peel oil. AS

#### CONFECTIONERY, STARCH AND SUGAR

- 834 Rajan (KK). The properties and appeal of lactose to the confectionery and bakery industries. *Confectionery Production* 55(6); 1989; 417

The properties and use of lactose in bakery and confectionery products are briefly mentioned. SYR

#### Confectionery

- 835 Frampton (A). Prevention of rancidity in confectionery and biscuits. *Manufacturing Confectioner* 69(6); 1989; 129-136

A bird's eye view of the progress made to prevent rancidity over the last thirty yrs in a number of important areas is discussed. Care in the selection of ingredients packaging materials and processing equipment as well as its shelf-life policies affect the success of rancidity prevention in confectionery and biscuits. SYR



- 836 Less (R). English confectionery. Changes in traditional products. Confectionery Production 55(12); 1989; 789, 792-793

The position of confectionery industry in UK is discussed briefly. The changes in demand for traditional products and demand for health foods are briefly discussed. SYR

- 837 Long (TJ). Continuous production of starlight mints. Manufacturing Confectioner 69(10); 1989; 80-81

The paper briefly describes the continuous production of starlight mints by means of co-extruder. Firstly the extruder was feeding into a forming machine to make regularly striped candies. Then the extruder was moved over to feed a rope sizer and then a ball machine to produce starlight mints which then went through a candy cooler. SYR

- 838 Mickelberry (WC). Application of freeze-dried fruits in confectionery products. Manufacturing Confectioner 69(6); 1989; 141-143

The advantages in usage of freeze-dried fruits in confectionery products are briefly described. Their applications and usage levels and availability are discussed. SYR

- 839 Woodroot (JG). Peanuts in confections. Manufacturing Confectioner 69(6); 1989; 137-140

The four different types of peanuts grown in U.S., their quality differences, shelf-life, preservation are briefly described. Also the types of nuts suitable for use in various confections are mentioned. SYR

- 840 Yella Reddy (S) and Prabhakar (JV). Confectionery fats from sal (Shorea robusta) fat and phulwara (Madhuca butyracea) butter. Food Chemistry 34(2); 1989; 131-139

Stearins from sal fat and phulwara butter were blended in selected proportions to obtain confectionery fats or cocoa butter extenders. The sal fat stearin was obtained by removing about 20% olein from sal fat by acetone fractionation at 15 C, and the phulwara butter stearin was obtained by two-stage acetone fractionation. In the first stage of phulwara butter fractionation, a small amount of stearin (equal to 10% by wt. of butter) was removed from the phulwara butter. The resulting olein was further fractionated at 15 C to obtain stearin (yield 65% by wt. of olein). The blends containing 75-85% of sal fat stearin and 15-25% of phulwara butter stearin had solidification properties and solid fat indices close to those of cocoa butter. These blends could be used as cocoa butter extenders. Cocoa butter extenders which impart a greater cooling sensation in the mouth were prepared by decreasing the proportion of sal fat stearin to 50-67% in the blend. The blends containing 50:50, 67:33, 75:25 and 85:15% of sal fat: phulwara butter stearins were compatible with cocoa butter when admixed even at equal proportions. The tolerances of the blends towards milk fat were similar to that of cocoa

butter. Thus, a series of cocoa butter extenders or confectionery fat, having a narrow melting range and melting profiles similar to those of cocoa butter could be prepared by altering the proportion of sal fat and phulwara butter stearins in the blends. AS

#### Candies

- 841 Ruffinatti (G). Batch processing of hard candy. Manufacturing Confectioner 69(10); 1989; 73-76

Automation in hard candy processing is described briefly. It can be achieved in the mixing of flavours, and colours kneading cooling pulling and transport of the product. The human intervention of handling the batches has been reduced at all stages by the use of modern machinery. SYR

- 842 Schluter (J). Continuous processing of hard candies. Manufacturing Confectioner 69(10); 1989; 70-71

The paper briefly summarises twenty yrs. of continuous hard candy processing. Recent developments in this area include production of sugarless and sugar substitute candies, the ability to feed multiple ropes to forming and wrapping machinery, and extrusion of multi-striped candy ropes. SYR

#### Chewing gum

- 843 Samton (HA). Recent development in the chewing gum industry. Confectionery Production 55(6); 1989; 401

The technical developments in the chewing gum industry are briefly described. These include development of new mixers, rolling machines, automatic coating drums, wrapping machines. etc. SYR

#### Chocolates

- 844 Urbanski (J). The effect of cocoa bean selection upon the characteristics of chocolate. Manufacturing Confectioner 69(6); 1989; 103-108

Some of the key factors influencing a manufacturer's selection of cocoa beans are briefly discussed. These include availability, quality price of the beans. The factors affecting flavour characteristics of cocoa beans, namely, botanical and geographical origin, farm level, harvesting practices, fermentation techniques and degree of roast. The effect of bean selection on the end product is briefly discussed. SYR

#### Cocoa

- 845 Bertimio (A) and Chiappa (O). Cocoa liquor roasting. Confectionery Production 55(6); 1989; 385-388

The advantages of cocoa liquor roasting over cocoa nibs or beans are mentioned and usage of Carle and Montanari type plant for



the purpose is described. SYR

#### Cocoa powder

- 846 Pesselman (RL), Loken (RG), Hoffman (MJ) and Feit (MJ). Determination of fluoride in cocoa powder by ion-selective electrode. Journal of Food Science 54(6); 1989; 1650, 1652

A method to determine free fluoride concn. in soluble cocoa powder by a fluoride-selective electrode was developed and validated. Calibration was linear over the 0.51 to 3.03 p.p.m. range. Free fluoride ion concn. data were in the 0.52 to 1.49 p.p.m. range, with recoveries varying from 81% to 89% using a standard addition procedure. AS

#### Licorice

- 847 Kaul Gmb (H). Antisticking and glazing agents for licorice products. Confectionery Production 55(6); 1989; 406-409

This paper was given at the sugar specialities seminar. The paper describes in detail about the psychological and the technical significance of glazing and antisticking agents in confectionery. Some of the technical characteristics of a good antisticking agent include lubrication, protection against drying, antisticking effect and gloss. Some of the requirements of glazing and antisticking agents are; should polish and prevent sticking; easy to apply; must comply with food regulation and it must be stable. The types of antisticking and glazing agents and their methods of application are also discussed. SZA

#### Starch

- 848 Collins (J). Starch conditioning. Manufacturing Confectioner 69(10); 1989; 53-55

The paper describes briefly about the mechanics of the starch conditioning process. Many products demand specific conditions within the starch for satisfactory production. Two of the major conditions are moisture content and temp. Method of achieving starch conditioning include the use of contact dryers, air stream dryers and fluidized bed dryers. SYR

- 849 Kuppinger (H). Drying methods for moulding starch. Manufacturing Confectioner 69(10); 1989; 57-62

The paper examined different starch drying and cooling systems to determine how they can be adopted to the various kinds of moulding powder plants. Criteria to consider in the selection of starch drying process include dryer efficiency, energy, requirements and consistent product quality. SYR

- 850 Marousis (SN), Karathanos (VT) and Saravacos (GD). Effect of sugars on the water diffusivity in hydrated granular starches. Journal of

Food Science 54(6); 1989; 1496-1500, 1552

The effective diffusivity of water ( $D$ ) in hydrated mixtures of two granular starches and three sugars (glucose, sucrose and dextrin) was investigated in the temp. range 40-100 °C. Spherical samples (2-cm diameter) of the hydrated mixtures were air-dried at controlled conditions and the  $D$  values at various moistures were estimated from the slopes of the drying curves. The sugars reduced significantly the  $D$  values in proportion to their mol. size. The changes in water diffusivity were related to the porosity of the samples. Temp. had an Arrhenius-type effect, and the estimated energies of activation for diffusion of water increased significantly by the addition of sugars. AS

- 851 Moore (CO). Moulding starches. Manufacturing Confectioner 69(10); 1989; 47-50

The production of moulding starch, various products available and options are discussed. Quality control of moulding starches is also described. SYR

- 852 Pullin (GE). Starch conditioning. Manufacturing Confectioner 69(10); 1989; 63-64

To get a clean, consistently textured dry starch by the use of heat pump principle of dehumidification is described. The product is dried at a lower cost and faster. SYR

- 853 Sievert (D) and Pomeranz (Y). Enzyme-resistant starch. I. Characterization and evaluation by enzymatic, thermoanalytical, and microscopic methods. Cereal Chemistry 66(4); 1989; 342-347

Formation of enzyme-resistant starch (RS) during autoclaving and cooling was investigated in starches from wheat, maize, potatoes, peas, waxy maize, and amylomaize. Amylose content and yield of RS were positively correlated. The highest yield (21.3%) was obtained from amylomaize VII starch (70% amylose). Formation of RS in amylomaize VII starch was affected by the starch/water ratio, autoclaving temp., and number of autoclaving-cooling cycles. The number of cycles exerted the most pronounced effect on RS; increasing the number of cycles up to 20 raised the RS levels to over 40%. Differential scanning calorimetry thermograms of amylomaize VII preparations and isolated RS exhibited an endothermic transition over a similar temp. range (120-165 °C), which could apparently be attributed to the melting of amylose crystallites. With increasing levels of RS in amylomaize VII starch preparations, a linear increase of melting enthalpies of amylomaize VII starch was recorded. Melting enthalpies of RS indicated changes in the quality of RS with increasing yields of RS. Furthermore, the thermoanalytical data suggested that amylose-lipid complexes were not involved in the formation of RS. Structural differences between heat-moisture and enzyme-treated amylomaize VII preparations, as illustrated by scanning electron microscopy, could be related to different melting enthalpies determined by differential scanning calorimetry. AS



- 854 Vongehaur (O). Starch conditioning. Manufacturing Confectioner 69(10); 1989; 51-52

The functions of starch conditioning are subdivided into sifting, drying, cooling and buffering. The advantages of an air flow drying or cooling unit for starch powder are mentioned. SYR

### BAKERY PRODUCTS

- 855 Chamberlain (N). The technological need for more than one flour and bread improver in UK bakery practice. Flour Milling and Baking Research Association Bulletin 2; 1989;

The article reviews the advantage and disadvantage of improving agents in bakery, which have a particular bearing on the benefits to be gained by alternative or combined use. Covers improvers for cake flour, biscuit and pastry flour, bread flour and bread flour bleaching agents. SRA

- 856 Christina Rask. Thermal properties of dough and bakery products. A review of published data. Journal of Food Engineering 9(3); 1989; 167-193

This review article describes an overview of the literature on the thermal properties of dough and bakery products to facilitate the estimation of values for the properties of a product of known moisture and density. This covers bread and dough properties, the influence of temp. and moisture content, modelling of the baking process, other bakery products, density, specific heat, thermal conductivity, and thermal diffusivity etc. NGKR

- 857 Menzies (J). Functional dairy ingredients for the catering, pastry and baking industry. Food Technology in Australia 41(3); 1989; 647-648, 650

In this paper the discussion was to present the broad spectrum of dairy ingredients available to the food industry, and their recognised applications specifically for the catering, pastry and bakery industries. Covers caseinates, whey protein conc., total milk proteins, milk protein hydrolysates, butter products, functional milk fats, and dairy powders. SRA

- 858 O'Palka (J), Eidet (I) and Abbott (J). Use of sodium bicarbonate and increased liquid levels in baked products containing sour mash corn dried distillers' grains. Journal of Food Science 54(6); 1989; 1507-1510, 1514

The effect of using sodium bicarbonate as an alkalizing agent and additional liquid in oatmeal muffins containing 17%, 33%, and 40% flour replacement levels of sour mash corn DDGS was investigated. Addition of sodium carbonate improved vol. while increased liquid levels improved mouth-feel and product appearance. Consumer testing

of yeast leavened dinner rolls, nut rolls, oatmeal muffin and carrot coconut breads containing sodium bicarbonate and additional liquid indicated that products were acceptable and that increased sodium levels due to sodium bicarbonate could be reduced by eliminating salt either partially or total from the formulations. AS

#### Bread

- 859 Alani (SR), Zabik (ME) and Uebersax (MA). Dry roasted pinto bean (*Phaseolus vulgaris*) flour in quick breads. *Cereal Chemistry* 66(4); 1989; 348-349
- 860 Qarooni (J), Wootton (M) and McMaster (G). Factors affecting the quality of Arabic bread. Additional ingredients. *Journal of the Science of Food and Agriculture* 48(2); 1989; 235-244

In this investigation the effect of ascorbic acid and potassium bromate, reducing agents (L-cysteine and sodium metabisulphite) emulsifiers (sodium stearoyl-2-lactylate and sucrose fatty acid esters) and a combination of these additives on the quality of Arabic bread has been studied. The results by statistical analysis showed that the internal quality parameters of Arabic bread remarkably deteriorated by addition of ascorbic acid and potassium bromate whereas the addition of reducing agents had the advantage of reducing mixing time and improving dough sheet quality. It is found that sodium stearoyl-2-lactylate at ( $3\text{g kg}^{-1}$ ) showed improvement in quality of Arabic bread especially after overnight storage whereas sucrose ester F-11 had an adverse effect on most aspects of Arabic bread quality. NGKR

#### Cookies

- 861 Hogenbirk (G). Coextruded cookies. *Manufacturing Confectioner* 69(10); 1989; 65-69

Factors to be considered in the manufacture of co-extruded cookies are discussed. These include equipment, dough comp., processing and ingredient, baking conditions and filling comp. The prevention of fat migration is also discussed. SYR

#### MILK AND DAIRY PRODUCTS

- 862 Goyal (GK) and Gupta (SK). Packaging of dairy products. A review. *Beverage & Food World* 16(1); 1989; 42-46

This review gives present status of packaging, general considerations for the selection of packages, packages of Western dairy products (table butter), flexible package for butter, recent advances, cheese, packaging requirements and flexible package for dried milk, ice cream, Indian dairy products (ghee), packaging requirement and materials for khoa and channa. 33 references. SRA



## Milk

- 863 Payne (KD), Rico-Munuz (E) and Davidson (PM). The antimicrobial activity of phenolic compounds against *Listeria monocytogenes* and their effectiveness in a model milk system. *Journal of Food Protection* 52(3); 1989; 151-153

The min. inhibitory concn. (MIC) of several phenolic compounds against eight strains of *Listeria monocytogenes* in tryptose phosphate agar (TPA) was determined. Based upon concn., the most effective compound was the phenolic antioxidant tertiary butylhydroquinone (TBHQ) which had a MIC of 64  $\mu\text{g/ml}$ . Among the FDA approved food antimicrobials, the most effective was propylparaben with a MIC of 512  $\mu\text{g/ml}$ . Propylparaben and TBHQ were then compared to potassium sorbate, a commonly used food antimicrobial, in a model milk system containing 10% nonfat milk solids. In this study, only one strain of the test microorganisms, Scott A, was used and two levels of inoculum, 10 and 100 CFU/ml, were tested. As expected with the basic pH of the model system, both phenolic compounds were significantly more effective than potassium sorbate against *L. monocytogenes* at 35 C. Both compounds caused a noticeable increase in lag phase of this microorganisms. There was about a three log difference in viable cell counts between propylparaben and TBHQ and the control. The TBHQ was inconsistent in its activity. The inhibitory action of propylparaben was not affected by the level of inoculum and had consistent activity throughout testing. AS

- 864 Goff (HD) and Jordan (WK). Action and emulsifiers in promoting fat destabilization during the manufacture of ice cream. *Journal of Dairy Science* 72(1); 1989; 18-29

Several emulsifier have been examined in ice cream processing to determine their relative emulsion destabilizing power. The hydrophilic lipophilic balance value of the emulsifier did not account for all the differences in destabilization; however, destabilizing power corresponded with the resulting interfacial tension between the serum and lipid phases of the mix. Fat destabilization results from the combination of ice crystallization and shear forces during ice cream manufacture. Neither shear nor ice crystallization alone were sufficient to cause the magnitude of destabilization encountered in a typical barrel freezer. It has also been shown that polyoxyethylene sorbitan monooleate, the most powerful destabilizing agent, reduced the amount of protein adsorbed to the fat globule surface. Thus, it is suggested that, based on their ability to lower the interfacial tension, emulsifiers control the adsorption of protein to the fat globule surface. The fat globules thus become more susceptible to coalescence induced by the shear forces of agitation and ice crystallization during ice cream manufacture. AS

- 865 Kamei (T), Sato (J), Sugimoto (Y), Suzuki (N) and Noda (K). Study on the microbiological assay for vitamin B12 of UHT cow's milk and infant formula using *Lactobacillus leichmannii*. *Journal of the Japanese Society of Food and Nutrition* '(Eiyo to Shokuryo)' 36(5); 1989; 409-416 (Ja).



Microbiological assay for vitamin B12 of UHT cow's milk and infant formula was studied using *Lactobacillus leichmannii*. The optimum conditions were as follows: the wavelength, pre-incubation time, initial cell concn. of test culture and incubation time were 520 nm, 5 hr,  $OD_{520}$  0.01 and 25 hr. resp. This method could decrease the total incubation time from 32-44 to 30 hr, and was not necessary in every day's subinoculation because activity of stock culture did not be reduced even in every a month. Recoveries of vitamin B12 were in the range of 95-107%. Repeatability and reproducibility of this method were better than those of other methods. AS

- 866 Kanno (C). Emulsifying properties of bovine milk fat globule membrane in milk fat emulsion. Condition for the reconstitution of milk fat globules. *Journal of Food Science* 54(6); 1989; 1534-1539

A procedure for the reconstitution of milk fat globules (MFG) stabilized with milk fat globule membrane (MFGM) was developed. MFG was reconstituted by homogenizing a mixture of 1% MFGM and 25% milk fat at 45 C and at pH 7.0 for 1 min. The emulsifying properties of MFGM were evaluated by emulsifying activity (EA) emulsion stability (ES), whippability and foam stability. Of the variables affecting the reconstitution of MFG, prolonged homogenization decreased EA and ES. About 25% milk fat gave max. EA and ES, increasing the MFGM concn. increased both EA and ES which were also influenced by the pH level. Foam disappeared at > 30 C. AS

- 867 Masi (P), Acierno (D) and Addeo (F). Measuring milk gelification by means of an instron universal testing machine operating in dynamic mode. *Journal of Texture Studies* 19(2); 1988; 161-170

This note describes a simple method to measure the kinetics of milk coagulum formation using an Instron Universal Testing Machine operating in dynamic mode. Coaxial cylinder geometry is used, applying to the internal cylinder a vertical periodical motion of 2 mm amplitude and constant speed of 1 cm/min. The flow conditions are similar to that applied in a sliding rheometer. The exp. can be equated to a periodical stress growth exp. as coagulation proceeds. Data produced according to this technique, provides information on the kinetic parameters which characterize the kinetic model currently used to describe milk coagulation. AS

- 868 Pouliot (Y), Boulet (M) and Paquin (P). An experimental technique for the study of milk salt balance. *Journal of Dairy Science* 72(1); 1989; 36-40

A new experimental device for the UF of milk at high temp. is described. The heating system permitted the holding of milk samples at high temp. from seconds to hours. UF unit equipped with a Romicon PM 50 hollow fiber UF cartridge achieved the isolation of milk permeate at temp. up to 90 C. The analysis for Ca, inorganic P, citric acid, Mg, Na, and K were made on the permeate. When compared with results from other techniques of separation, the results indicated a



greater extent of salt precipitation upon heating. AS

- 869 Schoonderwoerd (M) and Misra (V). Detection and quantitation of pea and soy derived proteins in calf milk replacers. *Journal of Dairy Science* 72(1); 1989; 157-161

Commercial samples of calf milk replacers were analysed by SDS-PAGE method. It was possible to detect and determine the degree of adulteration with pea and soy protein. JSS

- 870 Sue Brady (M) and Katz (SE). A microbial assay system for the conformation of results of receptor assays for antibiotic residues in milk. *Journal of Food Protection* 52(3); 1989; 198-201

A microbial assay system has been devised as a unified conformation procedure for antibiotic residues found in milk using the Charm II receptor assay. Chlortetracycline, streptomycin, erythromycin, penicillin and chloramphenicol residues are assayed using three organisms and five types of agar. Assay specificity is achieved by making use of the differences in the antibiotics activity at selected pH's and differences in stability with regard to enzymes and temp., as well as differences in the sensitivity of the organisms to different antibiotics. The system has the flexibility to be used piecemeal when only one or two residues require conformation, or in its entirety when conformation of multiple residues is needed. AS

- 871 Versaw (WK), Cuppett (SL), Winters (DD) and Williams (LE). An improved colorimetric assay for bacterial lipase in nonfat dry milk. *Journal of Food Science* 54(6); 1989; 1557-1558, 1568

A modification of McKellar and Cholette's (1986) colorimetric method for determining lipase activity in reconstituted non-fat dry milk was developed. The method uses the colour reaction between fast blue BB and the beta-naphthol (BN) enzymatically cleaved from beta-naphthyl caprylate (BNC) as a measure of lipase activity. In the modified method, a solvent system is used to clarify the sample rather than extracting the coloured product. This modification allows measurement of total sample lipase by excluding centrifugation. In addition, the modified method has greater sensitivity with equal ease of use. AS

- 872 Ward (GM). Recent research involving the transfer of radionuclides to milk. *Journal of Dairy Science* 72(1); 1989; 284-287

To evaluate the radionuclide intake of people from fallout contaminated milk requires information about feed sources and milk distribution. Pasture intake and the shelf-life of milk are important factors in the case of a short lived radionuclide like I. JSS

- 873 Wayne (JEB) and Shoemaker (CF). Rheological characterization of commercially processed fluid milks. *Journal of Texture Studies* 19(2); 1988; 143-152

Flow profiles of commercially processed whole, two per cent, one per cent and non-fat milks with added solids as well as skim milk without added solids were measured using a rotational steady shear viscometer. Also tested were mixtures of concentrated skim milk added to skim milk over a range of 9.7% to 20.2% total solids. A shear rate range of 121 to 486  $s^{-1}$  was used with a cone and plate geometry. In all cases, linear plots of shear stress versus shear rate with small non-zero intercepts were obtained. AS

#### Milk products

##### Cheese

- 874 Savello (PA), Ernstrom (CA) and Kalab (M). Microstructure and meltability of model process cheese made with rennet and acid casein. *Journal of Dairy Science* 72(1); 1989; 1-11

Experimental samples were prepared to standardisation of 39-40% moisture, 20-22% protein, 52-54% fat on dry basis, 4.5% salt on fresh wt. basis and 2.5% emulsifying salt. Undenatured or heat denatured whey proteins were added. Emulsifying salts affected the microstructure and meltability of cheese. Phosphate buffered samples were highly emulsified and poor in meltability. Citrate buffered samples were not as emulsified but melted well. Meltability decreased with increase in whey proteins. JSS

##### Cheddar cheese

- 875 Cliffe (AJ), Revell (D) and Law (BA). A method for the reverse phase high performance liquid chromatography of peptides from cheddar cheese. *Food Chemistry* 34(2); 1989; 147-160

A water-soluble nitrogen fraction (WSNF) was isolated from Cheddar cheese by a combination of extraction with water, methanol precipitation, removal of lipid with hexane, and permeation chromatography. The resultant product was fractionated using reverse phase fast protein liquid chromatography (FPLC). Processing of replicate cheese samples yielded final reverse phase chromatograms that were reproducible. Chemical analysis of an extract fractionated by reverse phase chromatography established that most peaks detected were either polypeptides or amino acids. The developed procedure may be suitable for carrying out time course profile studies of peptides produced during the accelerated ripening of Cheddar cheese. AS

- 876 Hill (AR) and Ferrier (LK). Composition and quality of Cheddar cheese. *Canadian Institute of Food Science and Technology Journal* 22(1); 1989; 75-79

Cheddar cheese samples aged 3-12 months were obtained from Ontario and Quebec cheese factories. A total of 73 samples were collected in two lots (38 samples collected in June, 1987 and 35 samples collected in July 1987), graded by an Agriculture Canada cheese



grader using a 10 point scale and analyzed for pH, fat, moisture and salt contents. The second lot (35 samples) was also analyzed for Ca, P, N content. Mean compositional values (%) and their respective coeff. of variation (%) were: moisture 34.4, 4.4; fat 33.5, 4.0; protein 24.2, 3.4; salt 1.69, 10.1; Ca 0.76, 11.8; P 0.51, 7.8. Regression analysis was used to evaluate relationships between grade scores for both texture and flavour and the following parameters; cheese pH, moisture in the non-fat substance (MNFS), salt in the moisture (SM), fat in the dry matter (FDM) Ca and P. None of the models tested were useful predictors of cheese quality. There was a weak ( $r = 0.57$ ) but significant ( $P < 0.001$ ) direct relationship between texture and flavour scores. SM decreased with increasing MNFS ( $P < 0.001$ ), and MNFS correlated directly with FDM. Molar ratios of Ca to P were inversely related to Ca content. AS

- 877 Kwak (HS), Jeon (IJ) and Perng (SK). Statistical patterns of lipase activities on the release of short-chain fatty acids in Cheddar cheese slurries. *Journal of Food Science* 54(6); 1989; 1559-1564

Twenty-five commercial food grade and analytical grade lipases were used to study the patterns of release of short-chain fatty acids (FFA) from milk fat in cheese slurries. Principal component Analysis showed that there were four distinctive groups indicated by the FFA ratios and five groups indicated by the FFA concn. Average Linkage Cluster Analysis also showed similar results although the patterns of FFA released were a matter of distance defined statistically between groups of lipases. All the lipases tested had distinctive specificities in hydrolyzing short chain FFA from milk fat, and their specificities on the FFA release were reflected on the groupings. AS

#### Milk proteins

- 878 Deshmukh (AR), Donker (JD), Addis (PB) and Jenness (R). Cellulose acetate and polyacrylamide gel electrophoresis for quantification of milk protein fractions. *Journal of Dairy Science* 72(1); 1989; 12-17

Cellulose acetate electrophoresis and PAGE techniques were compared for fractionation and quantification of milk proteins. Protein bands were stained with Ponceau-S and aniline blue black in the cellulose acetate electrophoresis and PAGE, resp. alpha casein and beta-casein absorbed almost equal quantities of Ponceau-S per unit wt. Whereas beta-casein absorbed more aniline blue black per unit than did alpha casein. Beta-Lactoglobulin, alpha-lactalbumin, and bovine serum albumin absorbed equal amounts of Ponceau-S per unit but differed in absorption of aniline blue black. It was concluded that cellulose acetate electrophoresis was the method of choice for rapid fractionation and quantification of milk proteins. AS

#### MEAT AND POULTRY

- 879 Taguchi (T), Ishizaki (S), Tanaka (M), Nagashima (Y) and Amano (K). Effect of ultraviolet irradiation on thermal gelation of muscle

pastes. Journal of Food Science 54(6); 1989; 1438-1440, 1465

The role of the actomyosin denaturation in the thermal gelation of muscle pastes by ultraviolet (UV) irradiation was studied. The pastes and actomyosins were obtained from sardine, beef, and pork. When UV irradiation ( $2,700 \text{ MUW/cm}^2$ ) from a photochemical mercury-arc lamp was applied to the pastes, the surface gel strength of thermal gels markedly increased with prolonged irradiating time. The effect of UV at 360 nm on the sardine gels was superior to that at 250 nm. UV denaturation of actomyosin ATPase revealed that activation of Mg-ATPase and decrease of EDTA-ATPase occurred simultaneously. The possible role of UV irradiation in the thermal gelation was discussed from the point of actomyosin ATPase. AS

#### Meat

- 880 Bowers (JA), Craig (J) and Williams (JC). Sensory characteristics, texture, colour, and selected nutrient content of veal muscle. Journal of Food Science 54(6); 1989; 1444-1449, 1470

Effect of cooking methods, internal end-point temp. cut and type of veal on yield, sensory characteristics, colour and texture were determined. Fatty acid profiles and fat, cholesterol and iron content were also determined for selected cuts of veal. In general, veal cooked at higher temp. and to a higher end-point temp. had greater cooking losses and less moisture and was less tender. Hunter Lab colour and Instron compression values also were affected by end-point temp. Muscles from the bottom round was redder and darker in colour, contained less moisture and more fat and had a more metallic flavour than muscle from the sirloin. Bob veal was more red and contained more moisture, cholesterol and iron but less fat than special fed veal (SFV). More meaty and sour flavour was detected in SFV than in Bob veal. AS

- 881 Draper (AM) and Zeece (MG). Thermal stability of Cathepsin. D. Journal of Food Science 54(6); 1989; 1651-1652

The effect of pH and temp. on Cathepsin D stability was examined using a hemoglobin assay following preincubation of the enzyme at various pH and temp. combinations. The results of the study showed that the enzyme retained 87% of its activity at 45 C (pH 3.5) when compared to a control at 37 C (pH 3.5). Further increase in temp. and pH resulted in decreased enzyme activity and approx. 43% remained at 55 C (pH 5.5). The amount of activity remaining at higher temp. decreased but suggested that the enzyme could contribute to textural changes in meat at temp. up to 60 C. AS

- 882 Kamoun (M) and Culioli (J). Mechanical behaviour of cooked meat under sinusoidal compression. Journal of Texture Studies 19(2); 1988; 117-136

The rheological behaviour of raw meat, and of meat cooked under different conditions, has been studied with sinusoidal compression in



a transient state. Meat samples underwent compression perpendicular to the myofibre axis in a cell equipped with lateral walls that made it possible to limit the free strain of samples to only one direction viz. parallel (longitudinal configuration) or perpendicular (transverse configuration) with respect to the myofibres. Both raw and cooked meat exhibit visco-elastic behaviour with a slight viscous component. Cooking meat results in both increased resistance and more elasticity. The variations in these parameters depend on the configuration and compression ratio used. With raw or slightly cooked meat, myofibrillar and connective structures can be analysed selectively in the longitudinal configuration by using compression ratios that are, resp., non-destructive and destructive. When cooking is carried out at a high temp., myofibrillar resistance can be analysed preferentially in the longitudinal configuration, and connective tissue in the transverse configuration. AS

- 883 Rosinki (MJ), Barmore (CR), Bridges (WCJr), Dick (RL) and Acton (JC). Phosphate type and salt concentration effect on shear strength of and packaging film adhesion to processed meat from a cook-in packaging system. *Journal of Food Science* 54(6); 1989; 1422-1425, 1430

Shear force values of product slices and adhesion at packaging film meat interfaces were measured for vacuum-packaged, cook-in-the-film prepared meat products. With 2.0% NaCl, phosphate addition at 0.4% increased both measures in the following order of effectiveness; sodium acid pyrophosphate > sodium tripolyphosphate > no phosphate. For NaCl effects, generally a 1% increase in concn. in the range of 0.5% to 4.0% was required to increase shear values of cooked products. Adhesion at the film-meat interface did not increase until the NaCl concn. was > 3.0%. In studying type of phosphate or NaCl concn. effects, higher adhesion occurred for packaging films having a nylon sealant layer as compared to films with sealants of Surlyn or a nylon-Surlyn blend. AS

#### Beef

- 884 Lombardi-Boccia (G) and Carnovale (E). In vitro estimation of iron availability from meals and beef. Effect of processing and fortification. *Journal of Food Science* 54(6); 1989; 1441-1443

The effect of meal comp., cooking, drying and fortification on in vitro iron availability from meals (50% meat, 50% vegetables) and meat was studied. Fortification was carried out with electrolytic iron powder. Unfortified samples were also studied. In fortified meals, iron availability (8.5% in raw samples) was not affected by cooking and drying processes. However, cooking and drying reduced chem. availability of iron in unfortified meals. Similar results were obtained with meat: upon cooking its iron availability showed a reduction of 26% and 4%, in unfortified and fortified samples, resp. Therefore, fortification reduced losses due to processing. Presence of vegetables (50%) reduced dialyzable iron by 35%. AS

- 885 Mann (TF), Reagan (JO), Lillard (DA), Campion (DR), Lyon (CE) and Miller (MF). Effects of phosphate in combination with nitrite of

Maillard reaction products upon warmed-over flavour in precooked, restructured beef chuck roasts. *Journal of Food Science* 54(6); 1989; 1431-1433, 1437

- 886 Rao (MV) and Gault (NFS). The influence of fibre-type composition and associated biochemical characteristics on the acid buffering capacities of several beef muscles. *Meat Science* 26(1); 1989; 5-18
- 887 Smith (SH), Plimpton (RFJr), Vanstavern (BD), Parrett (NA) and Ockerman (HW). Effect of pre-chill removal of kidney fat on young angus bull carcass quality and longissimus muscle tenderness. *Journal of Food Science* 54(6); 1989; 1434-1437

#### Pork

- 888 GiglielA), Butler (F) and Hudson (B). Alternative methods of pig chilling. *Meat Science* 26(1); 1989; 67-83
- 889 Jenkisen (RK), Thayer (DW) and Hansen (TJ). Effect of low-dose irradiation and post-irradiation cooking and storage on the thiamin content of fresh pork. *Journal of Food Science* 54(6); 1989; 1461-1465
- 890 Trout (GR). Colour and bind strength of restructured pork chops. Effect of calcium carbonate and sodium alginate concentration. *Journal of Food Science* 54(6); 1989; 1466-1470
- 891 Yasuhara (A) and Shibamoto (T). Analysis of aldehydes and ketones in the headspace of heated pork fat. *Journal of Food Science* 54(6); 1989; 1471-1472, 1484

#### Products

#### Meat

- 892 Blackwell (JH) and Rickansrud (DA). Ingredient effects on the thermal inactivation of foot-and-mouth disease virus in formulated, comminuted meat products. *Journal of Food Science* 54(6); 1989; 1479-1484
- 893 Okayama (T), Yamanoue (M), Kondo (K) and Nagata (Y). Effects of ribose, xylose and arabinose on colour formation in processed meat products. *Meat Science* 26(1); 1989; 39-45

The effects of ribose, xylose and arabinose on colour formation of meat products processed by emulsion curing were investigated in an aqueous model system under anaerobic conditions. Ribose markedly enhanced the colour forming ability, nitrite decomposition and reducing ability, depending upon its initial concn.; and xylose and arabinose exhibited some promoting effects on them. The colour promoting effects of ribose, xylose and arabinose increased with a rise in pH, in agreement with the results for reducing ability. This suggested that the reducing ability of ribose, xylose and arabinose plays a key role in promoting colour formation of meat products in emulsion curing. AS



## Frankfurters

- 894 Zayas (JF) and Lin (CS). Effect of the pretreatment of corn germ protein on the quality characteristics of frankfurters. *Journal of Food Science* 54(6); 1989; 1452-1456

The effects of methods of corn germ protein (CGP) pretreatment on the quality characteristics and storage stability of frankfurters were studied. CGP was incorporated in formulations of frankfurters as a powder, a stabilizer in a CGP-fat-water emulsion, and a stabilizer in preemulsified fatty tissue (PEFT). Incorporation of CGP and the method of CGP pretreatment did not affect meaty aroma, flavour and amino acid comp. of frankfurters. Water-holding capacity and yield of experimental products increased. The PEFT products had higher shear force values than control. Chem. tests indicated that amino N and total volatile N increased with time of storage at the same rate as for the control. AS

## Ham

- 895 Douglass (JS), Morrow (FD), Ono (K), Ketton (JT), Vanderslice (JT), Post (RC) and Willis (BW). Impact of sodium ascorbate and sodium erythorbate used in meat processing on the vitamin B12 contents of cured ham. *Journal of Food Science* 54(6); 1989; 1473-1474

Effects of sodium ascorbate (Na ascorbate) and sodium erythorbate (Na erythorbate) on vitamin B12 content of cured, cooked ham were investigated. Paired hams were injected with cure solution containing no curing accelerators or with cure solution containing Na ascorbate or Na erythorbate (3.28, 6.56, 9.84 g/L). There were no differences between vitamin B12 contents of hams containing added curing accelerators and paired controls, indicating that B12 was not destroyed by either Na ascorbate or Na erythorbate. Analysis of ascorbate, dehydroascorbate, isoascorbate and dehydroisoascorbate showed ascorbate to be the only substance present in Na ascorbate-treated hams and isoascorbic acid to be the only substance present in Na erythorbate treated hams. AS

- 896 Zubillaga (MP) and Maerker (G). Measurement of safrole and isosafrole in ham. *Journal of Food Science* 54(6); 1989; 1475-1478

## Hamburger

- 897 Chen (H), Singh (RP) and Reid (DS). Quality changes in hamburger meat during frozen storage. *International Journal of Refrigeration* 12(2); 1989; 88-94

Hamburger patties (fat content 13.05%) purchased from a local manufacturer were stored at five constant temp. (-5, -10, -15, -18 and -22 C) and one square wave variable (cyclical) temp. treatment for up to seven months. Three quality attributes, namely, extent of lipid autoxidation, discolouration, and decrease in water-holding capacity, were evaluated periodically. In addition I-POINT time-temp. indicators (type 2220) were attached to the meat packages and

the responses of the indicators were recorded. Kinetic models were tested and kinetic parameters were determined for the changes of all three quality attributes studied. The investigation reveals that all three quality attributes are strongly time-temp. dependent. Correlations obtained between the quality parameters and the indicator response show the usefulness of these indicators in the food distribution chain. AS

### Kilishi

- 898 Igene (IO). Lipid, fatty acid composition and storage stability of Kilishi, a sun-dried meat product. *Tropical Science* 28(3); 1989; 153-161

Kilishi was processed, stored for 60 wks at ambient temp. and its lipid and fatty acid comp. determined with an analysis of its oxidative stability. The total lipid content of Kilishi was 25% with the ratio of triglycerides and phospholipids being 9:1. Although the total per cent unsaturation in the triglycerides and phospholipids were 69.1 and 68.9 resp. The level of polyenoic fatty acids was significantly higher in the phospholipid (8.3%) than in the triglyceride fraction (1.4%). The proportions of saturated and dienoic fatty acids were comparable in the triglycerides and the phospholipids but the level of monoenoic fatty acids was much higher in the triglycerides (51.92%) than in the phospholipids (44.28%). Kilishi demonstrated an unusual lipid stability during storage, as measured by the thiobarbituric acid test. However, results showed that the major thiobarbituric reactive substance in the distillates of Kilishi, unlike in normal beef or chicken meat products, is not malonaldehyde but an unidentified, major peak at 435-440 nm in the visible spectrum of 400-700 nm wavelength. AS

### Sausages

- 899 Fryer (RL) and Prusa (KJ). Sensory analysis, composition, and instron measurements of turkey-beef breakfast sausage. *Poultry Science* 67(7); 1988; 1075-1079

Six treatment combinations for the production of breakfast sausage from turkey dark meat (6.8% fat) and beef (15.3% fat) were evaluated: 100% turkey/0% beef; 80% turkey/20% beef; 60% turkey/40% beef; 40% turkey/60% beef; 20% turkey/80%beef; and 0% turkey/100% beef. Sausage meats and commercial sausage seasoning (1.5%) were blended in a mixer, formed into patties, and broiled to an internal temp. of 77 C. Raw and cooked fat content, cooking losses, sensory attributes, 80% Instron compression, and colour were evaluated. Fat content of the cooked sausages and total cooking losses increased as the amount of beef increased in the formulation. Tenderness and juiciness increased and Instron compression values decreased as the amount of turkey in the formulation increased. AS



## Poultry

- 900 Dickens (JA) and Shackelford (AD). Feather-releasing forces related to stunning, scaling time, and scalding temperature. Poultry Science 67(7); 1988; 1069-1074

Factors of stunning vs. nonstunning, scalding time, and scalding temp. were studied to determine their individual effects on feather retention forces. Live birds were used as controls to determine feather retention forces as affected by flock, sex, and feather location. Forces were measured before stunning, after stunning for 20 and 120 S and after scalding for 1, 1.5, 2, and 2.5 min at scalding temp. of 52 C and 56 C. Stunning and scalding for longer times at higher temp. lowered the feather-pulling forces required. The percentage of reduction ranged from 18% after stunning, relative to the force required for nonstunned birds, to 81% after a 2.5 min, 56 C scalding, relative to the force required after scalding for 1 min at a temp. of 52 C. Processing parameters prior to picking have a definite effect on the feather-removal forces in chickens. AS

- 901 King (AJ), Ball (HRJr), Catignani (GL) and Swaisgood (HE). Physicochemical properties of ovalbumin and lysozyme treated with oleic acid. Journal of Food Science 54(6); 1989; 1639-1641

Results from polyacrylamide gel electrophoresis confirmed that proteins were more negatively charged in the presence of oleic acid. The electrophoretic mobility of unmodified and modified lysozyme was of opposite but similar magnitude. Critical micelle concn. (50.0  $\mu$ M) of oleic acid suggested that association between the fatty acid and proteins was mostly hydrophobic. Muramidase activity of modified lysozyme and difference spectra of modified ovalbumin suggested that oleic acid was partially or totally surrounding the proteins. Improved freeze-thaw characteristics of treated egg white were attributed to greater negative charge and instability of proteins produced by oleic acid. AS

## Chickens

- 902 Mahapatra (CM), Panda (B), Maitra (DN) and Pandey (NK). Yield, quality, composition and acceptability of meat from native and farm-bred chicken. A comparative study. Indian Journal of Animal Sciences 59(2); 1989; 1562-1564

## Broilers

- 903 Lin (CF), Gray (JI), Asghar (A), Buckley (DJ), Booren (AM) and Flegal (CJ). Effects of dietary oils and alpha-tocopherol supplementation on lipid composition and stability of broiler meat. Journal of Food Science 54(6); 1989; 1457-1460, 1484

Broilers were fed diets containing oils of varying degrees of unsaturation, namely coconut oil, olive oil, linseed oil and partially hydrogenated soybean oil (HSB0), with and without

alpha-tocopherol supplementation. The different oils significantly ( $P < 0.01$ ) affected the fatty acid comp. of the neutral lipids and to a lesser extent, the fatty acid comp. of the phospholipids. Fatty acid comp., in turn, influenced the oxidative stability of the meat during refrigerated and frozen storage. Meat from broilers fed olive oil or coconut oil was consistently more stable than meat from the linseed oil group. Dietary supplementation with alpha-tocopherol significantly ( $P < 0.01$ ) improved the oxidative stability of the dark and white broiler meat during refrigerated and frozen storage compared to meat from the broilers fed HSB0. AS

#### Turkey

- 904 Murphy (BD), Hasiak (RJ) and Sebranek (JG). Effect of antemortem electrical stunning of functional properties of turkey muscle. Poultry Science 67(7); 1988; 1062-1068

Muscles samples were collected from two groups of turkeys, one group electrically stunned before exsanguination and the other group non-stunned. Sampling was done at 0, 4, 8 and 24 h postmortem. Examination of muscles samples for glycogen, pH, adenosine triphosphate (ATP), R value (ratio of inosine nucleotides to adenosine nucleotides), and extractable protein demonstrated that glycolysis was delayed by electrical stunning. Muscle myofibrils, however, showed no effect of stunning of Mg -ATPase, sulphhydryls, or sodium dodecylsulphate-polyacrylamide gel electrophoresis patterns.

#### SEAFOODS

- 905 James (MA). Studies on the behaviour of salmonellae and Vibrio parahaemolyticus in refrigeration, freezing and storage of seafoods. Beverage & Food World 16(1); 1989; 34-38

Study describes the effect of low temp. conditions (refrigeration, freezing and further storage) on the initial and subsequent recovery, repair and growth of various sero-type of Salmonella and Vibrio parahaemolyticus in the substrates of different fish and shellfish. The results of this study has indicated that during refrigeration, freezing and keeping at cold storage temp. at  $-20^{\circ}\text{C}$  cannot be depended upon in all cases to kill completely or minimise the growth of microorganisms in seafoods. Further it is said that it is always better that the seafood products should be free of pathogenic organisms before subject to low temp. freezing and storage. SRA

#### Shrimps

- 906 Depaola (A), Perkins (BE), Harper (KP) and McPhearson (RM). Recovery of protein and microorganisms from shrimp peeler effluent. Journal of Food Science 54(6); 1989; 1660, 1662

A study was conducted to determine the quantity and quality of



proteinaceous solids recoverable from mechanical shrimp peeler effluent. Solids were recovered by HCl precipitation and centrifugation. Recovery of solids from untreated effluent was 1%-2% by wt. (ca 10% protein) and was predictable by turbidity. The precipitation/centrifugation process reduced supernatant total organic nitrogen and biochemical oxygen demand approx. 50% and turbidity by over 90% compared with untreated effluent. Total aerobic plate counts (APC) of bacteria recovered from unprocessed shrimp and precipitated solids were  $10^5$  -  $10^6$  CFU/g, approx. 1.5 log units greater than from peeled shrimp or untreated shrimp effluent. Total APC of bacteria recovered from clarified effluent was  $3.2 \times 10^1$  CFU/mL. AS

### Fish

- 907 Endo (K). Storage of fish at a temperature near its freezing point. Journal of the Japanese Society of Food and Nutrition ('Eiyo to Shokuryo') 36(5); 1989; 428-433
- 908 Oka (S), Ando (Y) and Oishi (K). Distribution of enterotoxigenic *Clostridium perfringens* in fish and shellfish. Bulletin of the Japanese Society of Scientific Fisheries ('Nihon Suisan Gakkai-shi') 55(1); 1989; 79-86

Distribution of enterotoxigenic *Clostridium perfringens* in freshwater fish and their diet, in marine fish, and in marine shellfish in the Southern part of Hokkaido was investigated. In addition, Hobbs' serotyping of isolates from these samples was performed. Enterotoxigenic strains from the samples heated at 75 C for 20 min were detected in 31.1% (19/61) of isolates from the intestinal tracts of freshwater fish, in 14.8% (8/54) of isolates from the intestinal tracts of marine fish. In addition 6.3% (4/63) of the isolates from marine shellfish were also enterotoxigenic. Of the isolates from the intestinal tracts of freshwater fish heated at 100 C for 60 min, 40.0% (2/5) were enterotoxigenic. Hobbs' serotype strains were detected in 22.1% (15/68) of isolates from the intestinal tracts of freshwater fish, in 12.5% (7/56) of isolates from the body surfaces and in 18.1% (23/127) of isolates from the intestinal tracts of marine fish, and in 9.9% (7/71) of isolates from marine shellfish. A total of 52 Hobbs' serotype strains were divided into 6 serotypes and a large number of them belonged to type 16. AS

- 909 Veciana-Nogues (MT), Vidal-Carou (MC) and Marine-Font (A). Histamine and tyramine in preserved and semi-preserved fish products. Journal of Food Science 54(6); 1989; 1653-1655

Data were obtained on histamine and tyramine contents in 48 samples of preserved and semi-preserved Spanish fish products. Ranges of concn. for both amines were wide: from 1.35 to 219.20 mg/kg for histamine, and from 0.5 to 66.40 mg/kg for tyramine. Higher concn. were found in semi-preserved anchovies than in the rest of the samples studied: canned tuna, herring, mackerel and sardines. In semi-preserved anchovies stored at room temp. (18-22 C), histamine production was observed after 6 months. The increase in histamine



was not observed in the samples stored under refrigeration (4-6 C). Tyramine did not increase at either temp. of storage. AS

### Alaska Pollock

- 910 Akahane (Y) and Shimizu (Y). Effects of pH and sodium chloride on the water holding capacity of surimi and its gel. Bulletin of the Japanese Society of Scientific Fisheries ('Nihon Suisan Gakkai-shi') 55(10); 1989; 1827-1832

Water in Alaska Pollock surimi and its gel was categorised into types IP-A ("free water") IP-B (loose "entrapped water") and IIP (tight "entrapped water") plus IIIP (immobilized water). The max. IP-A and the min. IP-B and IIP plus IIIP were estimated in both non-salt ground and salt-ground surimi at a pH of about 5; that is, the water-holding capacity (WHC) of surimi was min. at this pH. The quantity of IP-A in salt-ground surimi at pH values below 5 was higher, compared to that in the non-salt-ground one. With the increase of pH above 5, WHC of surimi markedly increased and the quantity of IP-A decreased more in the salt-ground surimi than in the non-salt ground material. The amount of IP-A in surimi at pH 7 (pH of surimi or Kamaboko), reached a min. after the addition of 2-3% of NaCl. After heating surimi at pH between 5 and 9 at 90 C for 40 min. quantity of IP-A was found less in salt-ground surimi gels than in non-salt-ground ones. Especially small quantities of IP-A and large quantities of IP-B were determined in the salt-ground surimi gel at pH 7, the pH of kamaboko with a high WHC. SGB

- 911 Akahane (Y) and Shimizu (Y). Changes in the water-holding capacity of surimi caused by the addition of water and sodium chloride and by the subsequent heat treatment. Bulletin of the Japanese Society of Scientific Fisheries ('Nihon Suisan Gakkai-shi') 55(10); 1989; 1821-1826

Changes in the status of water in frozen Surimi of Alaska Pollock during grinding with water (25%) and NaCl (2.5%) and subsequent heating (90 C, 120 C) were investigated. The water in surimi was classified into three types: IP, IIP and IIIP. Type IP water, regarded as bulk-phase water increased with addition of water into thawed surimi, whereas types IIP plus IIIP water, tightly immobilised in protein network, changed little. However, the type IP water in ground surimi markedly decreased with the addition of NaCl while the other two types increased, according to the hydration of the proteins. After heating the salt-ground surimi, type IP water increased and the types IIP plus IIIP water decreased proportionately. Type IP water could be further classified into two sub-states, IP-A and IP-B, by compressing gel slices under a series of low pressures between 3 and 10 kg/cm<sup>2</sup>. Type IP-A was regarded as "free" and IP-B as "entrapped" in gels. With the passing of heating time, IP-A water continuously increased and IP-B decreased continuously although IP (IP-A plus IP-B) water changed little. The increase of IP-A water was accompanied by the apparent increment of the released water on the cut surface of specimen. The amount of IP-A from gels highly correlated with "Hardness" as measured by texturometer. SGB



- 912 Boer (G) and Fennema (O). Effect of mixing and moisture modification on toughening and dimethylamine formation in Alaska Pollock mince during frozen storage at -10 C. *Journal of Food Science* 54(6); 1989; 1524-1529

Alaska Pollock minces having reduced, normal and elevated levels of moisture were stored at -10 C for 2 and 4 wk to determine how toughening was influenced by different amount of ice in the frozen tissue. Minces containing reduced or elevated amounts of ice exhibited greater toughening than that observed in control minces. Also, some minces received an extra mixing step prior to freezing and this resulted in less toughening during storage, perhaps due to oxygen incorporated and partial inhibition of the enzyme system that converted trimethylamine oxide to dimethylamine and formaldehyde. However, among moisture-modified minces that received the same mixing treatment, development of toughening did not relate in any consistent manner with the development of dimethylamine. AS

#### Crayfish

- 913 Tanchotikul (U) and Hsieh (TC-Y). Volatile flavour components in crayfish waste. *Journal of Food Science* 54(6); 1989; 1515-1520

Volatile components of crayfish processing waste were analyzed by dynamic headspace/capillary gas chromatography/mass spectrometry and chromatography-coupled aroma perception analysis with simultaneous photoionization detection. One hundred seventeen compound were identified. The majority of the flavour compounds previously identified in freshly boiled crayfish tail meat and hepatopancreas also were detected in crayfish waste. Many areas in the headspace profile contained good nutty, green woody, sweet fruity and very desirable salty meaty aromas, indicating the presence of important crayfish flavour components in the samples. AS

#### Krills

- 914 Kolakowska (A). Krill lipids after frozen storage of about one year in relation to storage time before freezing. *Nahrung* 33(3); 1989; 241-244

Batches of krill (*Euphausia superba* D.) were frozen immediately after capture and after 12, 24, 48 and 84 h of storage at 3 C. Comp. of lipids (classes), amount of carotenoids, and hydroperoxide value were determined before freezing and after 11 months of storage at 27 C. Due to the pre-freezing storage, the lipolytic activity was observed to increase in the frozen krill. At the same time, susceptibility of lipids and carotenoids to oxidation decreased. Freezing the krill 24 h after capture is most effective in inhibiting lipid oxidation and carotenoid decomposition. AS

#### Sardines

- 915 Nakayama (T), Oka (T), Ooi (A) and Niwa (E). Shortening of the time required for the dialysis process of preparing restructured sardine

meat. Bulletin of the Japanese Society of Scientific Fisheries ('Nihon Suisan Gakkai-shi') 55(10); 1989; 1807-1813

Restructured sardine meat was prepared from a mixture of washed pulverized sardine meat and sardine oil by adding sodium alginate and dialysing against CaCl solution. The reduction in time of dialysis and prevention of quality deterioration in this process was attempted. The dynamic rigidity  $G'$  and dynamic loss  $G''$  were measured to monitor the rheological state of the mixture before dialysis. Jelly strength and breaking deformation of the products were measured to monitor the progress of alginate calcium reaction during the dialysis process.  $G'$  and  $G''$  values of the mixture with sardine oil and water were smaller than those of the mixture using the oil only, while the gelly strength and breaking deformation of the products with oil and water were larger than those of the products with the oil only. It was concluded that the smaller the  $G'$  and  $G''$  values were, the faster the alginate-Ca reaction proceeded. In the sensory evaluation raw and cooked products with 0.8% sodium alginate, sardine oil and water were better in terms of texture than those with 2% sodium alginate, sardine oil and water. The larger breaking deformation of both raw and cooked products with 0.8% sodium alginate may be related to the better scores. SGB

- 916 Watabe (S), Ushio (M), Iwamoto (M), Kamal (M), Ioka (H) and Hashimoto (K). Rigor mortis progress of sardine and mackerel in association with ATP degradation and lactate accumulation. Bulletin of the Japanese Society of Scientific Fisheries ('Nihon Suisan Gakkai-shi') 55(10); 1989; 1833-1839

- 917 Yamamoto (Y) and Imose (K). Changes in fatty acid composition in sardines (*Sardinops melanosticta*) with cooking and refrigerated storage. Journal of Nutritional Science and Vitaminology 35(1); 1989; 39-47

The influence of cooking and later storage in a refrigerator for 7 days on the fatty acid comp. of lipids in sardines (*Sardinops melanosticta*) was studied. The total lipid and triacylglycerol (TG) levels did not change and the phospholipid (PL) level decreased somewhat with cooking or during storage. The fatty acid comp. of the total lipids and TG fractions was little changed and that in the PL fractions was somewhat changed by the cooking. The comp. of the polyunsaturated fatty acids (PUFA) in lipids of sardine precooked at 100 or 170 °C for 30 min changed from 42.7 to 38.3 or 33.5%, resp., for total lipids and from 51.5 to 38.4 or 37.6%, resp., for PL fractions during storage. The fatty acids in lipids from the ordinary meat of sardine was stable and those in the dark meat were extremely unstable during storage after cooking. It is concluded that the PUFA in the lipids of sardines were stable to cooking, but unstable to oxidation during storage in a refrigerator. The PUFA of lipids in the dark meat of sardine were extremely unstable to oxidation. AS

#### Tunas

- 918 Ogawa (Y). Studies on gape and heave of foodstuffs due to internal pressure during freezing. Freezing of tuna by calcium chloride brine



spray system. International Journal of Refrigeration 12(2); 1989; 95-106

The purposes of this study are to measure the internal pressure which causes gapes and heaves on the surfaces of a frozen body during CaCl immersion/spray freezing and to forestall these undue defects of frozen foodstuffs due to internal pressure. Exp. were carried out on the freezing of tuna fish. Both the temp. and the internal pressure of tuna fish were measured and recorded continuously with temp. sensors and pressure sensors during freezing. The results show that gapes and heaves were created on the surfaces of the sample tuna fish by internal pressure during freezing, and the internal pressure or the stress of the frozen body was released by a thermal equalizing process arranged during freezing. On the basis of the results of the experiments, a technique has been established, which is effective for preventing gapes or heaves in a frozen body during CaCl brine spray freezing. AS

- 919 Taguchi (T), Lo (JR), Tanaka (M), Nagashima (Y) and Amano (K). Thermal activation of actomyosin Mg-ATPase from ordinary and dark muscles of tuna and sardine. Journal of Food Science 54(6); 1989; 1521-1523, 1529

Changes in activities of actomyosin, acto-heavy meromyosin (actoHMM) and acto-subfragment-I (actoS-I) ATPase from tuna and sardine due to heat treatment (20, 25, 30, 35, 40 °C) were compared for ordinary muscle and dark muscle. Activation of ordinary muscle actomyosin Mg-ATPases was more than doubled for tuna and tripled for Sardine by heating at 35 °C, while activation of dark muscle actomyosin was not observed at any temp. The occurrence of thermal activation corresponded to a rapid loss of the EDTA-ATPase activity. Activation of hybrid actomyosins from dark and ordinary muscles was dependent upon myosin. For acto-HMM and acto-S-I thermal activation was not observed. The role of myosin tail fragments in thermal activation is discussed. AS

## Products

### Sausages

- 920 Demasi (TW), Grimes (LW), Dick (RL) and Acton (JC). Nitrosoheme pigment formation and light effects on colour properties of semidry, non-fermented and fermented sausages. Journal of Food Protection 52(3); 1989; 189-193

Development of the nitrosoheme pigment responsible for visual colour properties was studied in the preparation of cured, semidry non-fermented and fermented sausages. Colour stability of vacuum packaged sausages differing in pH was also evaluated during 6 wks of light exposure, and after 6 wks in dark storage. Total pigment conversion to nitrosoheme increased ( $P < 0.05$ ) during 9.75 h of fermentation at 38 °C. The max. pigment conversion attained upon heat processing to 60 °C appeared dependent on prior nitrosoheme formation during fermentation. Judd-Hunter tristimulus coordinates

of semidry sausages showed higher ( $P < 0.05$ ) initial  $+a$  (redness) values when the pH was 4.85 or 4.65 as compared to pH 5.30 or 6.00. During 6 wks of light exposure, sausage pH, and time in display were significant factors for each colour property. By the fourth and sixth wks of light exposure, non-fermented sausages (pH 6.0) had maintained redness characteristics better than all fermented sausages (pH 5.30, 4.85 and 4.65) as shown by higher  $+a$  and lower hue angle ( $\theta$ ) values. After 6 wks of light exposure or dark storage, there were no differences ( $P > 0.05$ ) in any colour property or nitrosoheme pigment content for non-fermented sausages. However, light exposure, as compared to dark storage, altered ( $P > 0.05$ ) all colour properties and reduced ( $P > 0.05$ ) the nitrosoheme pigment content for fermented sausages. AS

## PROTEIN FOODS

### Infant foods

- 921 Galdi (M), Carbone (N) and Valencia (ME). Comparison of ferric glycinate to ferrous sulphate in model infant formulas. Kinetics of vitamin losses. *Journal of Food Science* 54(6); 1989; 1530-1533, 1539

Ferric glycinate prooxidant properties were compared with those of ferrous sulphate in a powdered casein-based infant formula. About 60 p.p.m. of either iron source were added separately to the exp. formula. Fortified formulas were then stored at 20, 37, 45 °C for 12, 9 or 7 months resp. The samples were assayed periodically during storage for vitamins A, E, B1, B2, and C evaluation. Ferric glycinate fortification yielded a 30-50% deterioration of the rate constant values of those obtained for ferrous sulphate addition. A 10-30% increase in activation energy values was also observed when ferric glycinate replaced ferrous sulphate as iron source. Results demonstrated lower peroxidant properties of iron when added to this infant formula as ferric glycinate than when ferrous sulphate was present. AS

- 922 Moharram (YG), Abou-Elkhier (YI) and Osman (HOA). Weaning foods based on sesame protein. *Nahrung* 33(3); 1989; 245-248

An attempt has been made to prepare seven weaning foods and two high-protein biscuits based on sesame protein. The evaluation of their chemical comp. amino acids, physical and sensory properties showed the successful use of sesame flour in combination with dry skim milk and either corn or rice starch in preparing these types of food. AS



## ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

## Alcoholic beverages

## Beer

- 923 Fenz (R) and Galensa (R). Identification of 1-o-trans- coumaroylglycerol as an indicator of maize beer. Zeitschrift fur Lebensmittel-Untersuchung und -Forschung 188(4); 1989; 314-316

The phenolic acid, derivative, 1-o-trans-p-coumaroylglycerol, which until now has not been identified in food or beverages, was isolated from milled grains of Zea mays using preparative high performance liquid chromatography. The structure was established by spectroscopic and chemical means. 1-o-trans-p-coumaroylglycerol, a major compound of the phenols in maize is suitable for detecting an addition of maize to the mash in the beer-brewing process. AS

## Non-alcoholic beverages

## Coffee

- 924 Heyden (S) and Schneider (KA). Coffee and cholesterol. Cafe-Cacao-The 33(2); 1989; 109-113

Epidemiological studies recently carried out on men or women in Western industrialized countries have not shown in a statistically significant way, a negative effect of coffee or caffeine on the serum HD cholesterol or Apo-lipoprotein A-1 and B levels. The positive effect of coffee on serum cholesterol seems to be confined to hypercholesterolemic men and women or people who drink boiled coffee. BV

- 925 Ogawa (M), Kamiya (C) and Iida (Y). Contents of tocopherols in coffee beans, coffee infusions and instant coffee. Journal of Japanese Society of Food Science and Technology '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 490-494 (Ja).

Contents of tocopherols (alpha-, beta-, gamma-, and delta-Toc) in 14 kinds of green coffee beans, each of which had its own brand name, their roasted beans, infusions of those beans, and 38 kinds of instant coffee were determined by high-performance liquid chromatography. In 14 kinds of green coffee beans, total Toc of 12 kinds of them were more than 10 mg/'100g, the max. was 15.7 mg/100 g and the average was 11.9 mg/100g. The contents of alpha-Toc were 4.5 mg/100 g and the average was 3.5 mg/100 g. The contents of beta-Toc were 3.2 - 11.4 mg/100 g and the average was 8.4 mg/.100 g. Gamma-Toc and delta-Toc were not found. Eighty-three to ninety-nine% (average 94%) of total Toc, 79 - 100% (average 91%) of alpha-Toc and 84 - 100% (average 95%) of beta-Toc were remained after roasting. The content of beta-Toc in the coffee beans was higher than alpha-Toc whose ratio

was 1:2 - 3 except on whole ratio was 1:1.5. The content of total Toc in coffee infusion or instant coffee solution was 0.007 mg/100 ml. From these fact it was concluded that only 0.4 - 1.8% of Toc was infused from the roasted coffee beans. AS

- 926 Petaracco (M). Physico-chemical and structural characteristics of 'expresso' coffee brew. Tea and Coffee Trade Journal 161(12); 1989; 22-23, 26-27

#### Fruit juices

#### Apple juices

- 927 Coseteng (MY), McLellan (MR) and Downing (DL). Influence of titratable acidity and pH on intensity of sources of citric, malic, tartaric, lactic and acetic acids solutions and on the overall acceptability of imitation apple juice. Canadian Institute of Food Science and Technology Journal 22(1); 1989; 46-51

The results of this study indicated that sourness for citric, malic, tartaric and acetic acid solutions could be related to an interaction of both the titratable acidity and pH of the solution. One factor cannot be said to solely influence sourness. Different acids of equal wt. percent concn. (w/v%) and pH, elicit different levels of sourness. This difference is attributed to the unique chemical structure and property of each acid. Titratable acidity and pH levels also influence overall acceptability of imitation fruit beverages. AS

- 928 Van der Reit (WB), Botha (A) and Pinches (SE). The effect of dimethyldicarbonate on vegetative growth and ascospores of *Byssoschlamys fulva* suspended in apple juice and strawberry nectar. International Journal of Food Microbiology 8(2); 1989; 95-102

The effect of dimethyldicarbonate (DMDC) on vegetative growth elements as well as ascospores of two strains of *Byssoschlamys fulva* was investigated. Using apple juice as the suspending medium, vegetative growth was found to be sensitive to the compound at concn. of 25 to 75 mg/l; temp. had a marked influence on lethality, with treatment at higher temp. being far more lethal than low temp. treatment; ascospores were highly resistant to the compound, with no evidence of any lethal effects being found even at the highest concn. used (1 000 mg/l). An inoculated pack study, designed to stimulate the use of DMDC in fruit juices under practical conditions, was performed using commercially packaged apple juice or strawberry nectar as the suspending media. Packs, equilibrated to temp. of 10 C or 30 C, were aseptically inoculated with low numbers of either vegetative elements or ascospores and were treated with varying levels of DMDC. Mould development was monitored over a four wk period. Whereas vegetative growth was controlled at DMDC concn. of 50 to 100 mg/l at a treatment temp. of 30 C, ascospores displayed a great tolerance to the compound and survived exposure even in low numbers to high DMDC concn. AS



## Citrus juices

- 929 Fong (CH), Hasegawa (S), Herman (E) and Ou (P). Limonoid glucosides in commercial citrus juices. *Journal of Food Science* 54(6); 1989; 1505-1506

Commercial citrus juices were found to contain very high concn. of limonoid glucosides. TLC analyses showed the presence of these compounds averaging 320, 190 and 82 p.p.m. in orange, grapefruit and lemon juices, resp. The major glucoside in citrus juices was limonin 17-O-beta-D-glucopyranoside, which constituted over 50% of the total limonoid glucosides in the juices. AS

## Palm juices

- 930 Ajayi (OA), Fakiya (EO) and Oladapo (GO). Industrial processing of palm juice and riboflavin loss. *Food Chemistry* 34(2); 1989; 89-94

The effect of processing or season, or exposure to atm temp. on riboflavin content of industrially bottled palm juice was studied. Losses occurred in riboflavin content throughout the processing stages but loss was more pronounced after the filtration stage. The pasteurized palm juice contained about 60% of the initial riboflavin while the riboflavin content of fermenting palm juice increased significantly ( $P < 0.01$ ) with time of exposure. Losses occurred in pasteurized 'non-fermenting' samples similarly exposed. On the other hand, losses were not observed in pasteurized samples stored in the dark for 6 wks. Sun-inactivation may explain the significantly lower riboflavin content of samples processed in the dry compared to those processed in the rainy season. Findings from the study suggest that the nutritional value of processed palm juice may be raised if fermentation is allowed to proceed for 10 h before processing commences. Also, synthetic riboflavin may be incorporated at the pasteurization stage in non-fermenting juice. AS

## Pear juices

- 931 Ohtani (H), Ando (K), Tonohara (K), Ohta (H), Nawa (Y) and Watanabe (A). Clarification of Japanese pear juice by inorganic membranes. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 448-454 (Ja).

Inorganic UF membranes (mol. wt. cut off-(MWCO); 20 000 and 60 000 - 80 000 daltons) and two types of dynamic UF membranes (a pre-coat type and a self-rejecting type) were applied to clarify Japanese pear juice. The inorganic UF membrane of MWCO 60 000 - 80 000 and the dynamic UF membrane which was pre-coated by depositing Zr colloids on the surface of a ceramic support were suitable for clarification of the juice. They provided not only both high rejection ability of pectin and flux but also the similar sugar and acid contents to the commercial clear juice treated with pectinase. Separation of suspended solids in the sample juice by centrifugation caused a decrease in flux of the permeate of the dynamic UF membrane. During the clarification by the membrane, pectinase treatment of the

sample juice resulted in little change in the components, but gave higher permeate flux than without pectinase treatment. AS

### Soft drinks

- 932 Grenby (TH), Phillips (A), Desai (T) and Mistry (M). Laboratory studies of the dental properties of soft drinks. *British Journal of Nutrition* 62(2); 1989; 451-464

In this investigation the results of lab. studies of the dental properties of various soft drinks have been presented. Eight different drinks popular in UK market were examined by conducting demineralization exp. on hydroxylapatite, the basic component of dental enamel by detn. of calcium dissolving by atomic absorption spectroscopy and P by U.V. Visual spectrophotometry. It was found that the titrable acid gave better indication of their potential dental erosive property than their pH the demineralising effect on the hydroxylapatite of the acids already present in the soft drinks eclipsed the effect of the acid generated by oral microorganisms from the sugars present in the drinks. Out of the soft drinks studied the pure citrus juice proved the worst in dental decaying properties followed by the orange and black currant conc. after dilution to ready to drink form whereas cola and carbonated drinks showed the least demineralisation effect. NGKR

- 933 Robinson (J), Burke (V), Beaman (J), Hopkins (F) and Gracey (M). Antibacterial powdered soft drink base. A preliminary study. *Food Technology in Australia* 41(3); 1989; 667-670

A powdered soft drink base which is bactericidal in vitro against a strain of *Escherichia coli* which causes diarrhoea and produces both heat-labile and heat stable toxins is developed. The addition of saccharin or cyclamate to malic, tartaric or citric acids increased bacterial killing when compared to the effect of acids alone and bactericidal activity was greater with saccharin than with cyclamate. The combination of ascorbic acid with malic or tartaric acids also increased antibacterial activity. These effects could not be explained by changes in pH alone. Aspartame was not antimicrobial but it could be used as a sweetener, where saccharin and cyclamate are not permitted, by using the properties of the other constituents of drink base. Antibacterial soft-drink bases could be useful in reducing bacterial contamination in water of unsatisfactory microbiological quality. SRA

### Tea

- 934 Hara (Y), Watanabe (M) and Sakaguchi (G). The fate of *Clostridium botulinum* spores inoculated into tea drinks. Studies on antibacterial effects of tea polyphenols. Part.I. *Journal of the Japanese Society of Food and Nutrition* '(Eiyo to Shokuryo') 36(5); 1989; 375-379 (Ja).

*Clostridium botulinum* spores (a mixture of five type A and five type B strains) were inoculated (1000 spores per ml) into canned



liquid teas to see if they germinate, proliferate, or produce toxin during storage. Four kinds of canned tea drinks, i. e., brick-packed green black tea (lightly sweetened type and sugar supplemented type), green tea and oolong tea, were incubated anaerobically for 3 months at 30 C after inoculation and the viable countings decreased markedly in all tea drinks but green tea. Heat treatment of the inoculated green tea for 30 min at 85 C decreased the viable spores. All viable cells were heat-stable spores. Intraperitoneal injection of these incubates affected no mouse. To identify the effective components, black tea was fractionated into the tannic and non-tannic components. The spores incubated in the tannic component did not. The above results show that the tea drinks have a certain *C. botulinum* spore killing effect and the effect is due to the tannic (polyphenolic) components. AS

- 935 Kawamura (J) and Takeo (T). Antibacterial activity of tea catechin to *Streptococcus mutans*. Journal of Japanese Society of Food Science and Technology '(Nippon Shokuhin Kogyo Gakkaishi') 36(6); 1989; 463-467 (Ja).

Catechin fraction A (CF-A) containing (-)-epicatechin and (-)-epigallocatechin, fraction B (CF-B) containing (-) epicatechin gallate and () epigallocatechin gallate, CF-A and CF-B mixture (CF-mix), and (-)-epigallocatechin gallate (EGCg) were prepared from green tea by using the methods of YAYABE et al., and the antibacterial activity of catechins on the *S. mutans* was investigated. On the antibacterial effects of *S. mutans*, minimal inhibitory concn. (MIC) of CF-A, CF-B, CF-mix, and EGCg was 400 - 100, 100 - 50, 200 - 100, and 100 - 50 µg/ml, resp. MIC of chlorohexidine gluconate solution was less than 1.6 µg/ml. On the sterilization effect, an addition of 20 mg/ml of CF-B decreased the number of *S. mutans* from  $10^7$  to  $10^2$  after 3 min, while a chlorohexidine gluconate solution showed about 10 times higher sterilization activity. Although the antibacterial and sterilization effects of the CF-B were mild compared with those of chlorohexidine gluconate, it may be useful as a natural antibacterial reagent for a dentifrice or a mouthwash liquid etc, due to its reasonable antibacterial activity to *S. mutans*. AS

- 936 Liu (QJ), Horita (H), Haba (T), Yagi (A) and Ina (K). Flavour constituents of Chinese microbial-fermented tea Pu er Cha. Journal of Japanese Society of Food Science and Technology '(Nippon Shokuhin Kogyo Gakkaishi') 36(6); 1989; 486-489 (Ja).

The flavour constituents of Pu er Cha, which was made from Chinese green tea by microbial-fermentation, were analyzed by GC and GC-MS. The ether extracts of the samples have characteristic moldy odour. The main flavour constituents of them were constructed from linalool and its oxides, aliphatic aldehydes (n-hexanal, E-2-pentenal, E-2, Z-4-heptadienal etc), and ionones and its oxidising compounds (dihydroactinidiolide etc). These compounds seemed to be produced during manufacturing process such as solar drying and/or fermentation with microorganisms. AS



- 937 Okamoto (N) and Takeo (T). Determination of water content in Oolong tea and green tea by near infrared spectrophotometric analysis. *Journal of the Japanese Society of Food and Nutrition* '(Eiyo to Shokuryo)' 36(5); 1989; 400-402 (Ja).

Near infrared spectrophotometer was examined to determine the water content in Oolong-tea and Green-tea. The second derivative NIR spectra Oolong tea was nearly same as the result found in Green-tea and it showed a strong absorption at 1916 nm assigned to water. Calibration curve of water content in Oolong-tea and Green-tea was made up of adsorbance values and used samples data by the method of loss on drying samples in atm. pressure. The water content of unknown tea samples was determined by NIR method with uses of these calibration curve. And these data were compared with the measure by drying method. As a result, with the use of same kind of tea's calibration curve, the NIR method could compete in terms of accuracy with drying method. But, with the uses of different kind of tea's one, the errors were large. AS

#### FATS AND OILS

- 938 Chirife (J), Vigo (MS), Gomez (RG) and Favetto (GJ). Water activity and chemical composition of mayonnaises. *Journal of Food Science* 54(6); 1989; 1658-1659

The chemical comp. (pH, moisture, oil, NaCl, and sugars) and water activity of commercial samples of regular and diet mayonnaises was determined. The water activity of regular mayonnaises was around 0.93 and that of diet ones was close to 0.95. The water activity of mayonnaises was largely determined by the nature and concn. of soluble compounds in the water phase (e.g., NaCl, sugars, and acetic acid). Exp. performed with mayonnaise and related oil/water emulsions demonstrated that emulsification did not contribute significantly to lowering of water activity. AS

- 939 Usuki (R). Oxidative deterioration of commercial fried foods containing chlorophylls. *Journal of Japanese Society of Food Science and Technology* '(Nippon Shokuhin Kogyo Gakkaishi)' 36(6); 1989; 475-478 (Ja).

Recently, chlorophyll-containing fried foods and vegetables snacks have been widely consumed in Japan, because their green colour provides consumers with a good image for health. It is well known that oxidative deterioration of fats and oils is greatly enhanced by light, especially in the presence of chlorophylls. In this study, the oxidative deterioration of oils extracted from commercial fried foods containing chlorophylls was investigated, and the effect of light irradiation on the deterioration of those foods was examined. The following experimental results were obtained; (1) A marked deterioration was not observed in chlorophyll-containing fried foods ~~purchases~~ from two big supermarkets within one or two months from the production date. (2) On leaving fried snacks after unsealing at room



temp. under the dark for 2 wks, autoxidation of their fatty components obviously proceeded. (3) When several vegetable snacks were irradiated by light (sun light or 15 W fluorescent light) for 2 wks, a remarkable increase of peroxide values was observed in chlorophyll-containing vegetables (kidney beans and green peas). AS

### Fats

- 940 Adhikari (S) and Adhikari (J). Sal olein and mahua olein for direct edible use. *Journal of the American Oil Chemists' Society* 66(11); 1989; 1625-1630

Vegetable butter oleins are obtained as by-products during the fractionation process employed for making cocoa butter substitutes from sal and mahua. Outlets for these olein portions would not only ensure total utilization of these non-traditional oils, but would also provide an extension of edible oil supplies. The normal analytical characteristics and fatty acid comp. of the olein portions obtained from sal and mahua fats were investigated under appropriate conditions of time and temp. Sal olein was found to be rich in stearic (33.5-34.0%) and oleic acid (49.1-50.0), whereas mahua olein contained palmitic (18%), stearic (21%) and oleic (38%) acids. Projections from Schaal oven stability studies indicated that even without an antioxidant addition, the oleins could be stored for 4-5 months, and with 0.01% tertiary butyl hydroquinone, the storage life could be prolonged to over one yr. Deep-fat frying exp. indicated that the oleins showed a slow build up rate of total polar material and are quite suitable for such use. AS

- 941 Herzing (AG). Eutectic effect of fats. *Manufacturing Confectioner* 69(10); 1989; 83-87

The phase diagrams of fats used in confectionery centres with diluent fats and their consequences on the eating quality are discussed. The centre fats discussed include coconut, palm kernel and their hydrogenated product, peanut oil, butter fat etc. These diagrams provide important insight into the textural and organoleptic properties of the products. The replacement of tropical fats such as lauric oils/fats with cottonseed and soybean oils is seldom possible to achieve identical edibility, machinability and texture. SYR

- 942 Zamora (R), Millan (F), Hidalgo (FJ), Alaiz (M), Maza (MP), Otias (JM) and Vioque (E). Interaction between the peptide glutathione and linoleic acid hydroperoxide. *Nahrung* 33(3); 1989; 283-288

Incubation exp. in order to study the influence of some parameters in the fluorescence products formation have been carried out. It has been observed a greater efficiency with the relation linoleic acid hydroperoxide:glutathione, 2:1 and a temp. of 37 C. The complex formed working with labelled linoleic acid has been separated in two main fractions. The first one (without radioactivity) is fluorescent with excitation and emission max. at 350 nm and 440 nm, resp. It has been confirmed that this fraction consists of complex of glutathione and short chain aldehydes. The fluorescence of the complex did not



decrease by treatment with  $\text{NaBH}_4$  or with pH. The  $\text{NH}_2$  and SH groups take part in the lipid-peptide complex formation. The second, highly radioactive fraction includes free hydroperoxides and short chain hydroxy fatty acids. AS

#### Fatty acids

- 943 Rojo (JA) and Perkins (EG). Cyclic fatty acid monomer. Isolation and purification with solid phase extraction. Journal of the American Oil Chemists' Society 66(11); 1989; 1593-1595

The application of combined solid phase extraction (SPE) clean-up procedure to the isolation of a purified fraction containing all the monomeric cyclic fatty acid methyl esters is described. Extraction of the nonpolar lipid components from non-urea-adducting (NUA) filtrates is performed on a reverse phase octadecyl bonded silica minicolumn. Stepwise elution of the SPE-retained materials through silica gel using several solvents allowed the separation of a pure fraction containing the cyclic monomers than can be used for a more reliable quantitative estimation of these compounds in edible fats and oils. AS

#### Lipids

- 944 Kester (JJ) and Fennema (O). An edible film of lipids and cellulose ethers. Performance in a model frozen-food system. Journal of Food Science 54(6); 1989; 1390-1392, 1406

An edible, lipid-cellulose ether composite film was fabricated and tested as a barrier to internal moisture migration in a bicomponent food product stored under abusive conditions of frozen storage ( $-6.7^\circ\text{C}$  for 9 wk). The product consisted of bread and a tomato based sauce; the film was situated at the interface of the two components. The film effectively retarded migration of moisture from the sauce to the bread during storage. As a consequence, desirable sensory properties that were related to stabilization of moisture gradients, as measured following cooking, were maintained significantly better ( $P > 0.05$ ) in the presence of the film than they were in its absence. AS

- 945 Kester (JJ) and Fennema (O). An edible film of lipids and cellulose ethers. Barrier properties of moisture vapour transmission and structural evaluation. Journal of Food Science 54(6); 1989; 1383-1389

An edible, composite film of lipid and cellulose ethers was developed and appraised as a barrier to moisture vapour transmission. The film was comprised of a matrix of methylcellulose, hydroxypropyl methylcellulose and saturated  $\text{C}_{18}$  and  $\text{C}_{20}$  fatty acids, with a thin layer of white beeswax laminated to the surface. The edible film effectively retarded transport of moisture at water activities up to at least 0.97 and maintained good barrier properties even when the water activity on the low-humidity side of the film was relatively high. The apparent activation energy for water vapour transmission through the edible film was 1.42 plus or minus 2.5 Kcal/mole. Elec-



tron microscopy revealed the importance of lipid morphology in determining moisture resistance lipid base films. AS

#### Oils

- 946 Anon. New technologies for augmenting edible oil supplies. Beverage & Food World 16(1); 1989; 32-33

- 947 Chiba (T), Takazawa (M) and Fujimoto (K). A simple method for estimating carbonyl content in peroxide coating oils. Journal of the American Oil Chemists' Society 66(11); 1989; 1588-592

In this method, peroxides, which interfere with carbonyl detn., are reduced with triphenyl phosphine prior to carbonyl detn. Carbonyl content is measured by a colorimetric 2,4-dinitrophenyl hydrazone procedure. Neither triphenyl phosphine nor triphenyl phosphine oxide, oxidation products of triphenyl phosphine by reaction with peroxides, interfere with the measurement of carbonyl content. The method is applicable to several kinds of oxidized oils in any oxidation stage. AS

- 948 Guth (OJ), Aronhime (J) and Garti (N). Polymorphic transitions of mixed triglycerides, SOS, in the presence of sorbitan monostearate. Journal of the American Oil Chemists' Society 66(11); 1989; 1606-1613

The polymorphic behaviour of 1,3-distearoyl-2-oleoglycerol (SOS) has been investigated in the presence of a selected food emulsifier, sorbitan monostearate. Five polymorphs, named alpha-, Gamma-, Pseudo-, Beta-, and Beta - were crystallised and identified by both X-rays and DSC. MNK

- 949 Rao (SK) and Artz (WE). Effect of extrusion on lipid oxidation. Journal of Food Science 54(6); 1989; 1580-1583

To examine extrusion temp. effects on oil stability, corn meal/starch with soybean oil was extruded, frozen immediately in liquid nitrogen, freeze-dried and ground. The conjugable oxidation products (COP), oxodiene values (OV), peroxide values (PV) and conjugated dienes were determined during storage. There was an increase in COP, OV, PV, and conjugated dienes with an increase in extrusion temp. An increase in transition metal content, particularly iron, occurred with an increase in extrusion temp. Starch and soybean oil were extruded with 50 p.p.m. ferrous acetate (dry wt.) and 50 p.p.m. butylated hydroxyanisole (BHA) (oil wt.). Ferrous acetate reduced the oxidation relative to the control, which contained neither antioxidant nor iron, and relative to the sample containing BHA. AS

#### Artocarpus integrifolia oils

- 950 Daulatabad (CD) and Mirajkar (AM). Ricinoleic acid in Artocarpus integrifolia seed oil. Journal of the American Oil Chemists' Society 66(11); 1989; 1631

Seed oil of Artocarpus integrifolia syn. Artocarpus heterophyl-

lus belonging to the Moraceae family contains a small amount of ricinoleic acid (7.2%). The identification was made on the basis of TLC, IR, NMR, MS and chemical degradation. The major components of the oil are linoleic acid (40.2%) and palmitic acid (30.2%). AS

#### Groundnut oils

- 951 Uematsu (T) and Ishii (K). Browning of peanut oil in the presence of amino acid and the properties of browned rancid oil. Journal of the Japanese Society of Food and Nutrition '(Eiyo to Shokuryo') 36(5); 1989; 395-399 (Ja).

Florisil-treated peanut oil (10 ml) was adsorbed on Whatman No. 42 filter papers with or without 10 mmol amino acid (alanine, valine and proline) and then the filter papers were incubated at 50 °C for 60 days in the dark. In the presence of these amino acids, browning of peanut oil occurred along with oxidation and its intensity was the strongest with proline. However, no browning took place when only peanut oil was incubated. The iodine value of peanut oil decreased to 32 - 38 after 60 days, suggesting polymerization and degradation of the oil. And, the ratio of unsaturated fatty acid total fatty acid of the oil decreased to some extent during incubation. POV and the total carbonyl increased to reach max. after 30 days. TBA value of peanut oil alone was higher than that with the amino acids during incubation. Browned rancid oil fluoresced at 411-421 nm when excited at 338-343 nm. However, no fluorescence was detected in the rancid oil without the amino acids. AS

#### Rapeseed oils

- 952 Hawrysh (ZJ), Shand (PJ), Tokarska (B) and Lin (C). Effects of tertiary butylhydroquinone on storage stability of canola oil. II. Practical storage. Canadian Institute of Food Science and Technology Journal 22(1); 1989; 40-45

The sensory (odour and flavour), chemical (peroxide and thio-barbituric acid values) and gas liquid chromatography (GLC) characteristics of tertiary butylhydroquinone (TBHQ) treated canola oils stored in clear and amber glass bottles in the presence of light (1400 lux) for up to 16 W were determined. In addition, odour and chemical characteristics of the TBHQ treated oils in clear bottles stored in the dark for up to 16 W were determined. Chemical and GLC data indicated that TBHQ retarded oxidative changes however, this protective effect was not reflected in sensory odour and flavour scores. TBHQ may increase the storage stability of canola oil; however, the relationship between sensory and chemical/GLC data requires further study. Oils stored in clear bottles (in presence of light) had greater oxidative changes than those in amber glass bottles. Oil samples in clear bottles stored in the absence of light maintained almost unchanged high quality during the entire storage period. Therefore, to maintain oil quality, canola oil should be protected from light. AS



- 953 Yoshida (H) and Alexander (JC). Changes in enzymic hydrolysis in vitro of thermoxidised canola oil. *Journal of the Science of Food and Agriculture* 48(2); 1989; 245-248

In this study thermoxidised canola oil heated for various periods of time was fractionated to provide four classes of acylglycerol products based on polarity differences. The study revealed that after 70 h. of heating the amount of hydrolysis of the acylglycerol dimers was only about half and that for the trimers about one third that of the monomers. The higher polymers were the least hydrolysed and showed no further reaction after 5 min. The reduction in enzymic hydrolysis of isolated fractions from the thermoxidised oils indicated structural differences related to formation of polar compounds and polymerisation products. NGKR

#### Soybean oils

- 954 Boki (K), Shinoda (S) and Ohno (S). Effects of filtering through bleaching media on decrease of peroxide value of autoxidized soybean oil. *Journal of Food Science* 54(6); 1989; 1601-1603

The effect of filtering through bleaching media on decrease of peroxide value (PV) of autoxidized soybean oil were investigated to improve its quality. Sixteen kinds of filtering and bleaching media were employed. The standard activated clay was the most effective in decreasing the peroxides in autoxidized soybean oil. The relationships between the decrease of PV and the physical or the chemical properties of the media were examined. It was found that peroxides are reduced in proportion to the amount of acid at the highest acid strength range +1.5 to -5.6 rather than amount of acid at the lower acid strength range, total amount of acid or specific surface area of medium. AS

- 955 Rennie (BD) and Tanner (JW). Fatty acid composition of oil from soybean seeds grown at extreme temperatures. *Journal of the American Oil Chemists' Society* 66(11); 1989; 1622-1624

Temp. during seed development is known to influence the level of the various fatty acids in soybean (*Glycine max* L.) Merr.) oil. In order to determine the range of values that can be obtained for each fatty acid, five lines (A5, C1640, N78-2245, PI 123440 and PI 361088B) known to possess low linolenic acid (18:3) levels, one line (A6) known to possess a high stearic acid (18:0) level, and two cvs. (Century and Maple Arrow) were grown at 40/30, 28/22, and 15/12 C day/night. At 40/30 C, high oleic acid (18:1), low linoleic acid (18:2), and low linolenic acid levels were obtained that were beyond the range of levels reported for the soybean germplasm. The linolenic acid levels for A5, C1640 and N78-2245 grown at 40/30 C were below 2.0%, and are the lowest values reported for soybean oil. A6 displayed a high level of stearic acid at 28/22 and 40/30 C but displayed a relatively low level at 15/12 C. This indicates that temp. may affect the expression of the *fas<sup>a</sup>* allele, which is responsible for high stearic acid levels in A6. The linolenic acid levels of PI 361088B and C1640, both possessing the *fan* allele, were the lowest

for all lines grown at 15/12 C. Therefore, the fan allele is an appropriate source for the development of low linolenic acid lines adapted to cool areas. AS

## SPICES AND CONDIMENTS

### Essential oils

#### Mexican Oregano oil

- 956 Pino (J), Rosado (A), Baluja (R) and Borges (P). Analysis of the essential oil of Mexican oregano (*Lippia graveolens* HBK). *Nahrung* 33(3); 1989; 289-295

The comp. of the volatile oil of Mexican oregano (*Lippia graveolens* HBK) isolated by steam distillation was investigated by means of column chromatograph, gas chromatography and mass spectrometry. A total of 33 components were identified including 22 hydrocarbons, 4 alcohols, 4 ethers, 2 phenols and 1 ketone. Of the 33 components observed in the present study 7 were identified in Mexican oregano for the first time. AS

### Spices

#### Dills

- 957 Paakkonen (K), Malmsten (T) and Hyvonen (L). Effects of drying method, packaging, and storage temperature and time on the quality of dill (*Anethum graveolens* L.). *Journal of Food Science* 54(6); 1989; 1485-1486, 1495

Sorption isotherms, colour and sensory quality of the dill herb (*Anethum graveolens* L.) were determined over a 2 yr period in exp. investigating the effect of packaging and storage temp. and time for air-dried and freeze-dried dill. The intensity scoring of odour and taste was significantly ( $P < 0.01$ ) poorer for the dried dills than for frozen dill. Drying with heated air and the subsequent deteriorative processes essentially altered the odour and taste. In the case of freeze dried dill the storage conditions were important; when storage was at room temp. (23 C) the intensity of the odour and taste was better preserved in vacuum packages than in glass jars or paper bags. AS

## SENSORY EVALUATION

- 958 Balaban (M), Carrillo (AR) and Kokini (JL). A computerized method to analyze the creep behaviour of viscoelastic foods. *Journal of Texture Studies* 19(2); 1988; 171-183

A computer-aided method was developed to simplify the analysis



of creep behaviour and to determine the elasticity, the Newtonian viscosity and individual viscosities of viscoelastic foods. The method enabled the inclusion of all creep compliance data in the analysis, and reduced the analysis time from hours to minutes. The method was tested in the calculation of rheological properties of wheat flour dough. AS

- 959 Hutchings (JB) and Lillford (PJ). The perception of food texture. The philosophy of the breakdown path. *Journal of Texture Studies* 19(2); 88; 103-115

Many authors have drawn attention to the limitations of present texture testing methods. To a great extent this may be due to the assumption that the perception of the structural properties of foods is comprised of a series of single attributes. This philosophy may account for the failure of the single instrumental measurement as a reliable texture descriptor. The present paper emphasizes that texture perception is a dynamic sensory monitor of changes made to a food by processes occurring in the mouth. A general three dimensional model applicable to foods is postulated with "Degree of structure", "Degree of Lubrication" and "Time" as its axes. As each food is changed in the mouth, it described its own "Breakdown Path" throughout the three dimensions. This approach is seen as the start of a general hypothesis for the physics and psychophysics of mastication. AS

- 960 Stevenson (JM), Seman (DL), Weatherall (IL) and Littlejohn (RP). Evaluation of venison colour by an objective method using CIELAB values. *Journal of Food Science* 54(6); 1989; 1661-1662

A trained colour panel was used to score both venison colour and colour acceptability for comparison with instrumental colour measurements. Panel colour scores were highly correlated with acceptability ( $r = 0.97$ ) and could be predicted from CIE  $L^*$ ,  $a^*$  and  $b^*$  values by regression ( $R_{\text{adj}} = 0.84$ ). The use of  $a^*$  alone explained the greatest amount of variation ( $R_{\text{adj}} = 0.78$ ), and the inclusion of both  $L^*$  and  $b^*$  significantly improved the model. The use of hue angle and chroma either individually or in combination with  $L^*$  did not provide better relationships. The use of  $L^*$ ,  $a^*$ , and  $b^*$  is recommended for satisfactory prediction of panel colour scores of venison with no less than three observations per sample. AS

#### FOOD STORAGE

## INFESTATION CONTROL AND PESTICIDES

## Pesticides

## Insecticides

- 961 Saroj Jain and Yadav (TD). Persistence of deltamethrin, etrimfos and malathion on different storage surfaces. Pesticides 23(11); 1989; 21-24

Persistence of emulsifiable conc. (EC) formulation of deltamethrin, etrimfos and malathion was tested 10, 50 and 150 mg a.i. M on ten different surfaces viz., glass, aluminium, black polythene, tile, painted and unpaired plywood, cement, mud filter paper and jute against 1-2 days old adults of *Callosobruchus maculatus* Fab., *C. chinensis* Linn. and *C. analis* Fab. Persistence of wettable powder (WP) formulation of deltamethrin (K-othrine) was also tested on these surface against the three test sp. upto storage period of 180 days. An assessment of mean gross persistency values of different insecticides on all the surfaces tested showed that deltamethrin possessed the highest persistency followed in decreasing order by malathion and etrimfos for all the test sp. The overall effectiveness of different surfaces in retaining the toxicity of different insecticides, based on mean gross persistency values, followed the order: black polythene (7992) > plywood (7708) > filter paper (6992) > aluminium (6528) > jute (6258) > glass (5910) > tile (5241) > painted plywood (4325) > cement (2857) > mud (789). WP formulation gave complete control of all the test sp. on all the surfaces till the end of experiment. AS

## BIOCHEMISTRY AND NUTRITION

## Biochemistry

- 962 Arntfield (SD), Murray (ED), Ismond (MAH) and Bernatsky (AM). Role of the thermal denaturation-aggregation relationship in determining the rheological properties of heat induced networks for ovalbumin and vicilin. Journal of Food Science 54(6); 1989; 1624-1631

Heat-induced denaturation (determined by differential scanning calorimetry plus ANS fluorescence and structure development assessed by dynamic testing) were monitored for ovalbumin and vicilin to evaluate the importance of these processes on the rheological characteristics of resulting protein networks. Protein denaturation preceded structure development, based on an increase in the storage modulus ( $G'$ ). Reduction of the temp. between denaturation and aggregation through pH manipulation or inclusion of stabilizing salts lowered  $G'$  values in the resulting network. In contrast, in the presence of SDS,  $G'$  values increased with (ovalbumin) or were unrelated to (vicilin) reduced temp. differences. This demonstrated the importance of a balance of attractive and repulsive forces when exa-



mining network characteristics. AS

- 963 Brown (GL). A simple test for heat-damaged protein. An evaluation. Flour Milling Baking Research Association Bulletin 2; 1989;

The protein solubility test (PST) was found to be both quick (4 min) and easy to perform, with an acceptable degree of reproducibility occurring between samples. Although preliminary investigations would suggest that the degree of heat-damage calculated from the PST is unlikely to be accurate. The test has potential as an absolute indicator of heat damage. The PST does have a limited potential for use at mill intake. SRA

- 964 Howard (P) and Mahoney (RR). Effect of dietary fibers on the enzymatic digestion of casein. Food Chemistry 34(2); 1989; 141-146

Pectin (P), guar gum (GG) and wheat bran (WB) all caused small reductions (greater than or equal to 15%) in the digestion of casein by trypsin and chymotrypsin. Lignin (L) and cocoa fiber caused reductions of more than 30% for both enzymes. Lower shaker speeds during digestion further reduced activity of chymotrypsin for P and GG but had no effect for WB and L. Casein digestion, as measured by a multi-enzyme assay, was reduced by 5-10% when each fiber was used at a level of 1% cocoa fiber and lignin had the most effect. The results support the concept that dietary fibers contribute to lower protein utilization in animals by decreasing intestinal proteolysis. AS

- 965 Kitabatake (N), Tani (Y) and Doi (E). Rheological properties of heat-induced ovalbumin gels prepared by two-step and one-step heating methods Journal of Food Science 54(6); 1989; 1632-1638

Ovalbumin gave a transparent solution, transparent gel, or opaque gel on heating at low ionic strength, but a turbid gel, or turbid suspension at high ionic strength (one-step heating). The ovalbumin solution, once heated at low ionic strength, gave a transparent gel with a second heating at high ionic strength (two-step heating). Textural parameters of hardness and adhesiveness, viscoelastic parameters from creep curves, breaking energy and water-holding capacity of these gels were measured. Transparent gels by the one- or two- step heating were firm and elastic and had high water-holding capacity. Turbid gels by one- step heating were soft and less elastic and had low water-holding capacity. The relationship between gel properties and structure was discussed. AS

- 966 Socorow (M), Levy-Benshimol (A) and Tovar (J). In vitro digestibility of cereal and legume (*Phaseolus vulgaris*) starch by bovine, porcine and human pancreatic alpha-amylases. Effect of dietary fiber. Starch/Stärke 41(2); 1989; 69-71

The effect of heat treatment and dietary fiber from whole and dehulled black bean (*Phaseolus vulgaris*) seeds on digestibility of various starches by bovine, porcine and human pancreatic alpha-amylases was studied. Corn, rice, wheat and black bean starch

digestibility increased after heating. The degree of hydrolysis of black beans starch ranged between 56 and 83% of the values obtained for cereal starches depending on the enzyme used. Enzyme activity was: human > porcine > bovine regardless of the substrate employed. Dietary fiber decreased starch digestibility by porcine enzyme. This effect was more marked when whole grain fiber was used. Black bean and rice starch digestibility by human amylase was not affected by fiber, while corn and wheat starch hydrolysis was slightly inhibited. The use of the human enzyme is recommended for in vitro amylolysis assays. Attention is called on the difficulties of extrapolating results obtained with animal enzymes to humans. AS

#### TOXICOLOGY

Nil

#### FOOD LAWS AND REGULATIONS

Nil





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